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American Machinist

AUGUST 3, 1953

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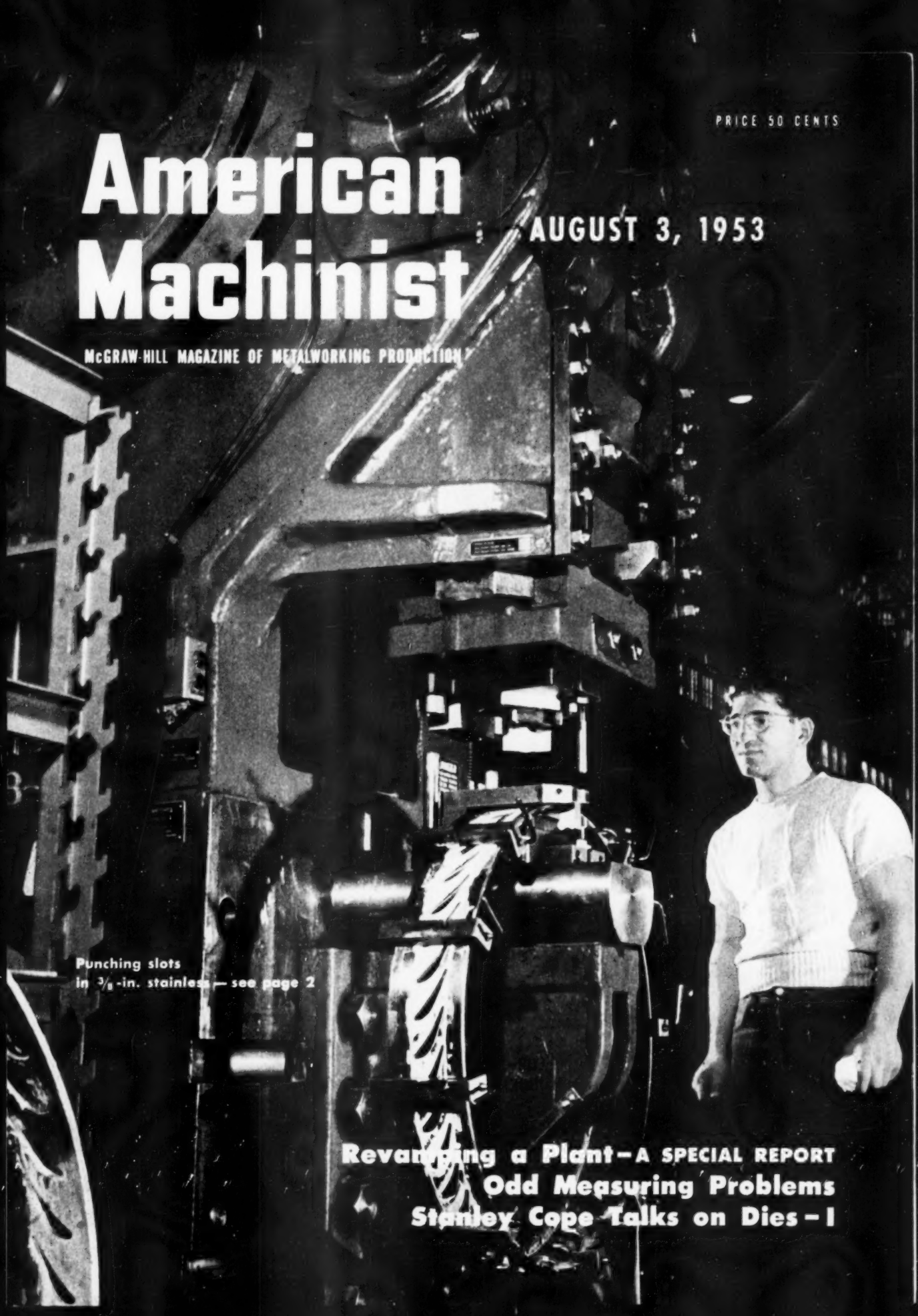
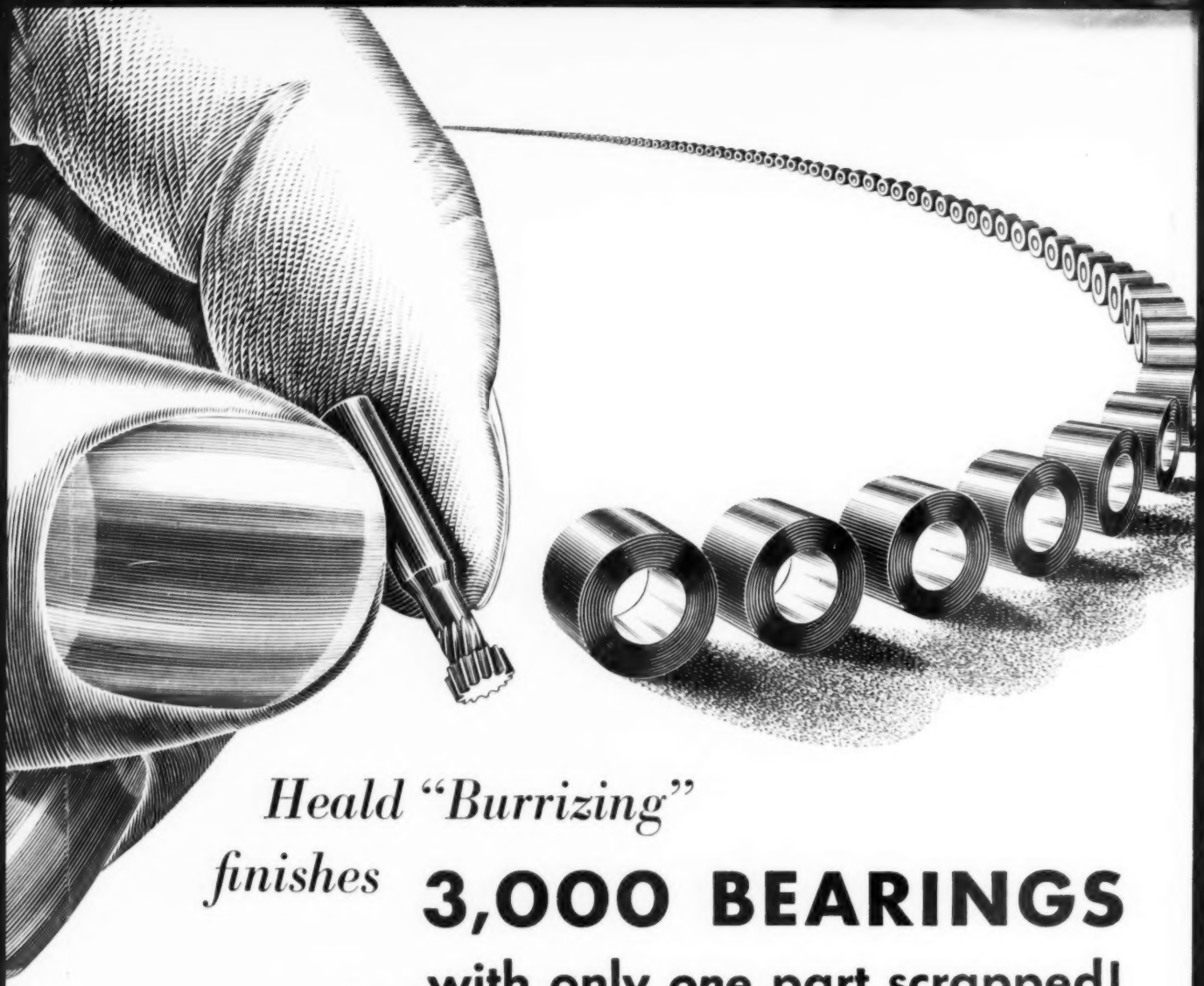


Punching slots in 3/8-in. stainless — see page 2

Revamping a Plant — A SPECIAL REPORT

Odd Measuring Problems

Stanley Cope Talks on Dies — I



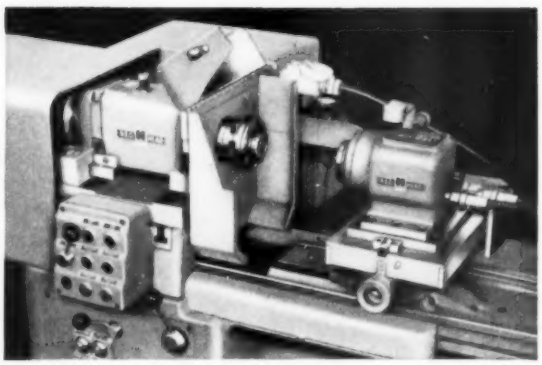
Heald "Burrizing" *finishes* 3,000 BEARINGS

. . . with only *one* part scrapped!

The use of a burr instead of a boring tool on a Heald Bore-Matic is somewhat unusual, but when it's practical, interesting things happen. Here's a case in point.

A model 121 Bore-Matic, equipped with a high-frequency grinding wheelhead, uses a ⅛" shank burr for precision finishing the I.D. of miniature bearing races. Size limits of .0002", .000050" for roundness and .0001" for concentricity are easily held. Three thousand parts have been finished in five, seven-hour shifts—with but a *single scrap part!* Burr is dressed intermittently by a diamond hone and customer reports that tool life lasts up to 5,000 pieces!

Remember—when it comes to precision finishing, it pays to come to Heald.



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MAGAZINE OF METALWORKING PRODUCTION

CONTENTS FOR AUGUST 3, 1953

VOL 97 NO. 16

ADMINISTRATION

103 EDITORIAL *Burnham Finney*

132 ARE MACHINE TOOLS TOO ELABORATE? *E J Tangerman*

137 TOOLROOM OR SCHOOLROOM? *Round Table*

SPECIAL REPORT

121 HOW TO REVAMP A MODERN PLANT *Edmond M James*

MATERIAL CUTTING, FORMING

120 CARBIDE TOOLS GROUND WITH SiC *John C Redmond*

138 SHOP SHOTS

140 CUTOFF DIE CLIPS WIRE SQUARE *Hjalmar Dahl*

140 CURLING DIE AND WOOD PUNCH *T H Hsu*

149 TIME FOR DRILLING MILD STEEL *V G Hotchkiss*

INSPECTION

105 ODD MEASURING PROBLEMS *Frank K Archibald*

SHIPPING

119 IBM PACKS EFFICIENTLY, TOO *Herbert Chase*

MATERIALS HANDLING

114 WORKING-HEIGHT HANDLING MOVES TANK SPRINGS *Russell A Graham*

ENGINEERING

110 KNOW YOUR TERMINOLOGY FOR DRAWN SHELLS *Stanley R Cope*

147 STANDARD PILOT NUTS FOR DIES *J R Paquin*

151 STANDARD PUNCH AND DIE CLEARANCES *J R Paquin*

TOOLING

108 INGENIOUS TOOLHOLDER SAVES MACHINE DOWNTIME *M Maloney*

140 CLAY TEMPLET TRANSFERS SHAPE *George H Griffith*

141 ADJUSTABLE SNAP GAGE *Ray Gentry*

141 SPRING WIRE USED AS MANDREL *C Y Lee*

141 SMALL TOOLBIT HOLDER *Milton E Johnson*

142 LOCATING PINS SUBSTITUTE FOR DRILLING *C Y Lee*

142 CENTERING SLEEVE FOR CUTTING TOOL *Henry Gifford*

142 AUTOMATIC UNDERCUTTING TOOL *W I Morgan*

143 ATTACHMENT FOR CUTTING SPIRAL OIL GROOVES *Allan Clarke*

143 FORM TOOL BANDS BRACKET THREE WAYS *Herbert H Fronicke*

143 ALL-STEEL HAMMER LASTS *N Palmer*

144 BORE-LAPPING SPINDLE DRIVE *B Goodwin*

144 ADJUSTABLE DRILL JIG *Hjalmar Dahl*

NEWS OF METALWORKING

89 SPOT NEWS

91 WASHINGTON

93 DETROIT

95 MACHINE TOOLS

99 GAGING METALWORKING

162 NAMES IN THE NEWS

DEPARTMENTS

82 BACKLASH

140 PRACTICAL IDEAS

147 REFERENCE BOOK SHEETS

153 TALKING SHOP

164 EQUIPMENT, MATERIALS, PARTS

186 TANGENTS

190 ROUND TABLE DISCUSSION

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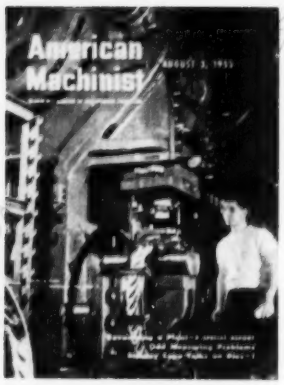


chips

NOZZLE RING . . . A bit unusual is the heavy-duty punching setup on our front cover. It is the die arrangement on a Bliss press at General Electric, Schenectady, for punching slots through a $\frac{3}{8}$-in.-thick stainless gas-turbine nozzle ring. Close tolerances are required.

ODD JOBS . . . Frank Archibald, of Arthur D Little Co, wrote our current lead article covering odd measuring problems. He gives toolmaker's "heritage" explanations of such things as surface flatness and how to pull a pin. These are the kinks that are hard to come by.

COPE TALKS . . . Stanley R Cope, president of the Acme School of Die Design Engrg, is a well-known consultant and lecturer, as well as being celebrated as a teacher. In this issue, he starts a lengthy series on design of drawing dies, including much information not previously published. Included are rules, formulas, methods for computing shells, and procedures for developing practical dies. Don't miss it.

REVAMPING . . . Metalab, Inc, builds cabinets and lab furniture of steel. Founded postwar, it has grown so fast that it has literally grown out of its breeches several times. E James, chief engineer, tells of the problems of systematizing production and keeping materials moving in our current Special Report. Nothing can clutter up a plant like unfinished big cabinets. The author applied his automotive experience to welding, materials handling, presswork and assembly; thus achieving smooth work flow, more production, and reduced labor.

TORSION BARS . . . Tanks and other heavy vehicles may replace conventional leaf or coil springs with torsion bars. Russell A Graham of Maremont Auto Products tells in five pages of pictures how to make them, emphasizing the material-handling methods. Rails faced with wood and special racks are important in the setup.

WIRE WRAPPING . . . Bell labs has a tricky way of producing solderless joints on wires for electronic and radio equipment. Ends are wrapped into quick, positive joint which can be disassembled quickly if necessary. Here are engineering data and pictures.

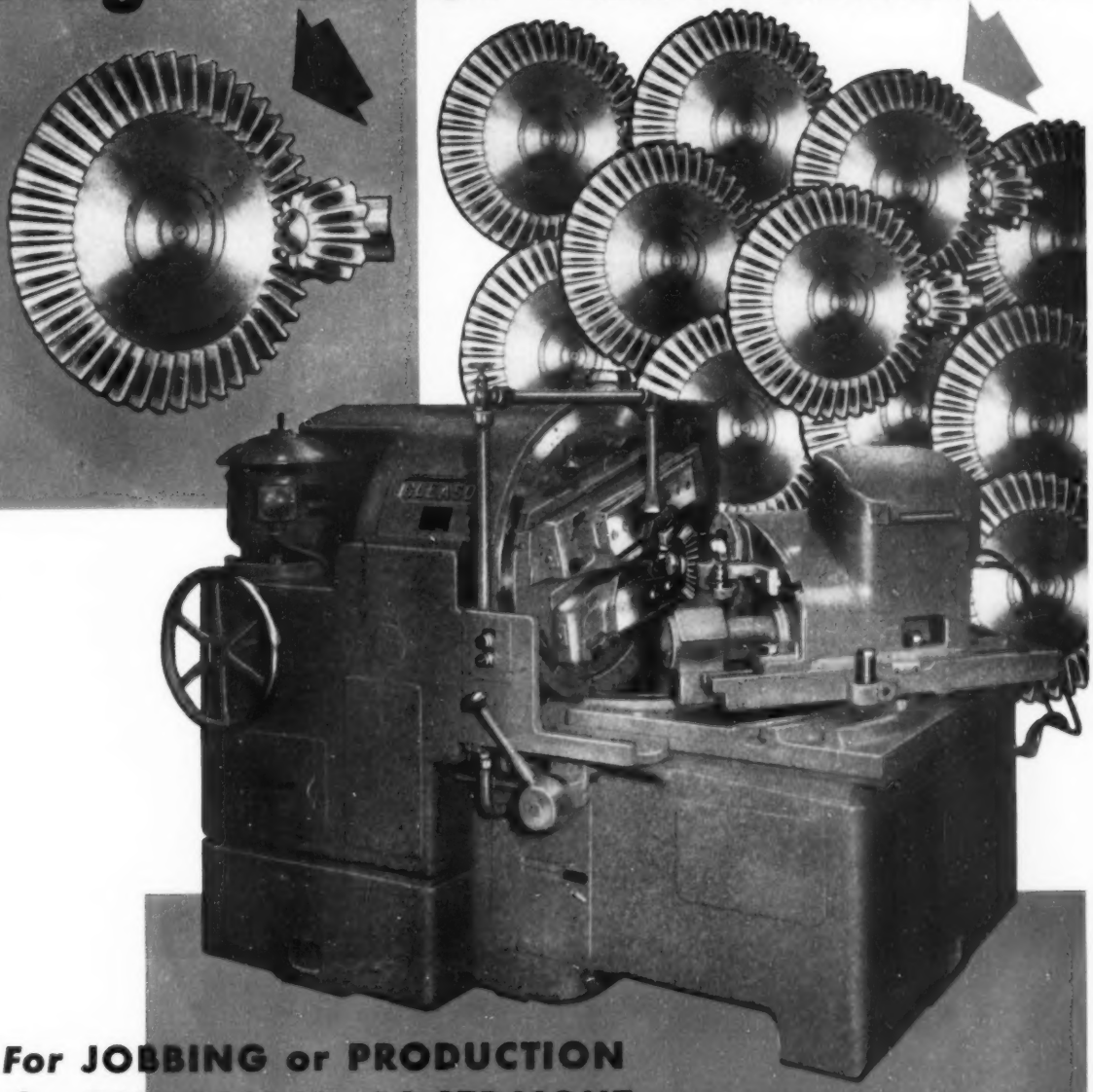
TOOLING . . . In addition to other articles featuring tooling, we have several shorts. One is about an ingenious toolholder that saves downtime, described by M Maloney of Walter Kidde Co. Bits can be changed in seconds without making machine adjustments . . . Another story concerns that current argument of diamond vs SiC wheels for sharpening cemented carbides. Kennametal's research Lab has come up with a new situation, that of silicon inclusions in the ground edge.

COMING . . . August 17 *AM* will bring you a proper hot-weather diet of short, easy-to-read, but important, data. The lead article will concern precision machining of parts for goniometers, which are angle-measuring instruments. The Special Report is an excellent roundup on hard surfacing. There'll be another in Stanley Cope's series on drawing-die design, plus articles on cutting toolmaking costs, putting new men to work, straightening bent shafts, mechanized dip soldering, on chip handling, and on a tricky press. The cover will show a planer doing contouring—an unusual setup.

STANLEY R COPE . . . is familiar to shopmen all over the country as the president of Acme School of Die Design Engineering and Coltax Tool Engineering Company, both of South Bend, Ind. He is the author of two major series of textbooks, one on die-design engineering and one on tool-design engineering used in franchised schools. He was formerly chief die engineer at Bendix Products Division of Bendix Aviation Corp and is past chairman of ASTE Chapter 30 of South Bend. He is also a member of the Tool & Die Institute of Chicago, ASEE, and the Pressed Metal Institute, of which latter organization he was a director.

In this issue is the first of a series by Mr Cope on drawing die design.

Single Lots or Thousands...



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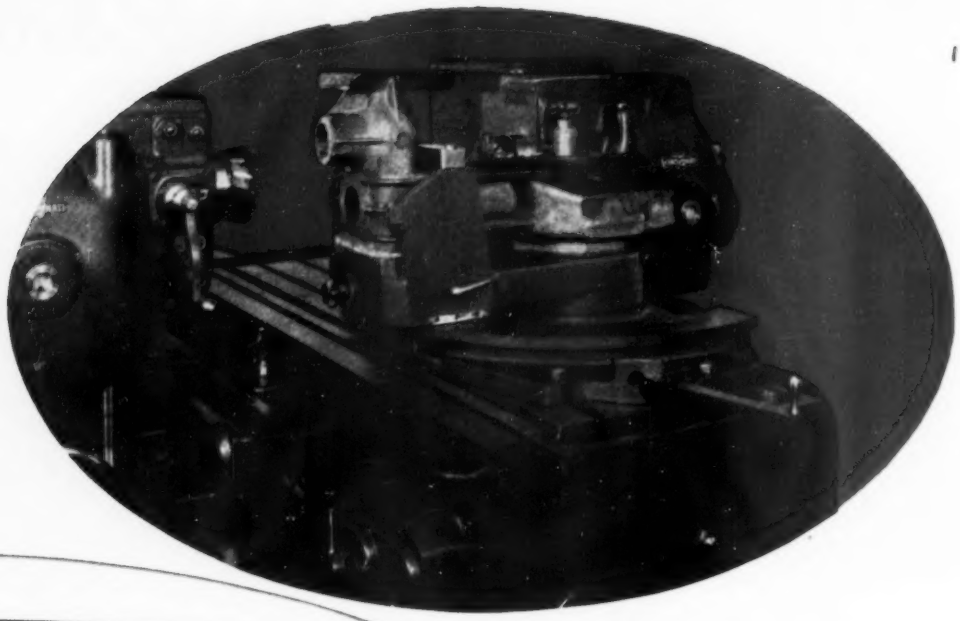
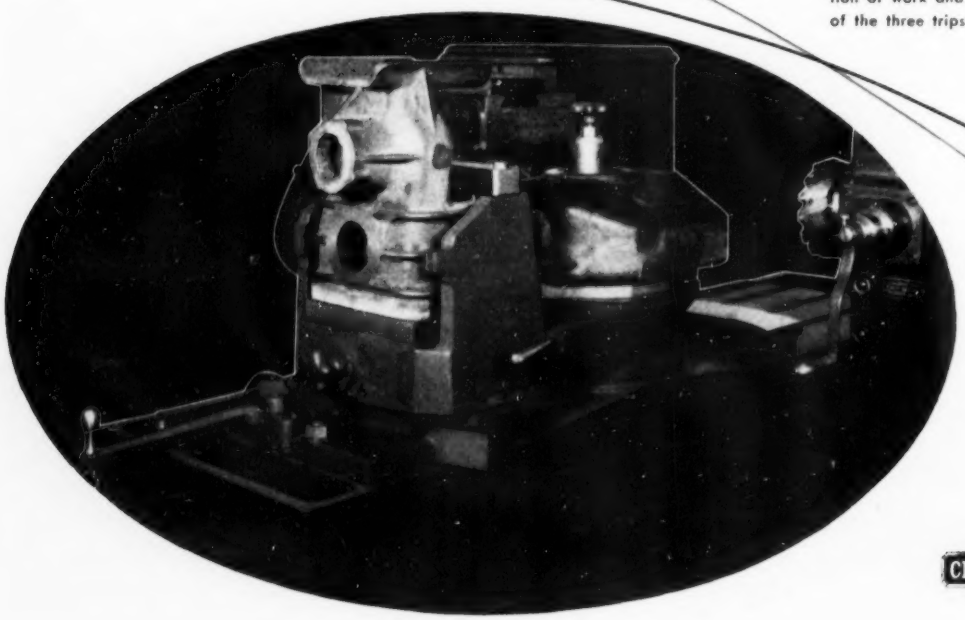


These two illustrations show the position of work and index fixture for two of the three trips past the cutters.



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This Ingenious Hydromatic Setup Combines 2 operations in one

You always come out ahead when machining operations are combined. In this example, four surfaces are milled in one setting of the work, resulting in a 50% saving in setup time and handling time for a builder of agricultural machinery. ¶ To gain the advantage of two cutter spindles working together, Cincinnati Application Engineers assigned the job to a duplex style CINCINNATI Hydromatic Milling Machine. One fixture and one handling of the work takes care of what ordinarily would be considered two operations. The fixture has three index positions. (See explanatory drawings.) With sintered carbide face mills and a feed cycle which cuts in both directions of table traverse, an excellent finish is produced at low cost. ¶ CINCINNATI Hydromatics offer several advantages for work of this type: automatic table feed cycles, one-way or two-way feed; seven ranges of spindle speeds with plenty of power for high speed steel and sintered carbide cutters; standard and complementary units to provide special machine features at low cost. ¶ For complete information write for catalog No. M-1670-1.

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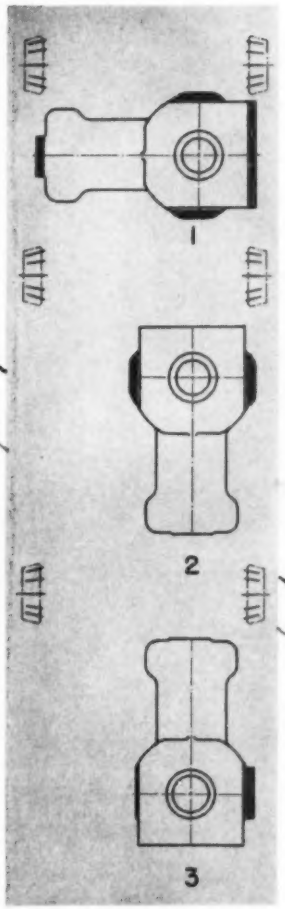
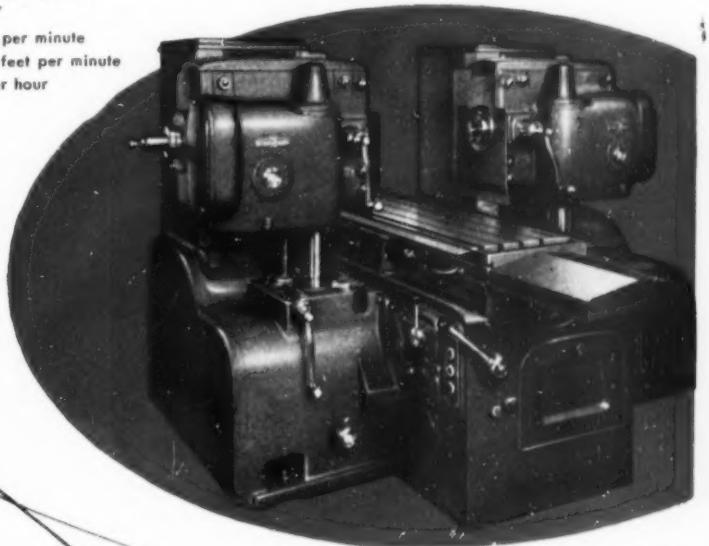
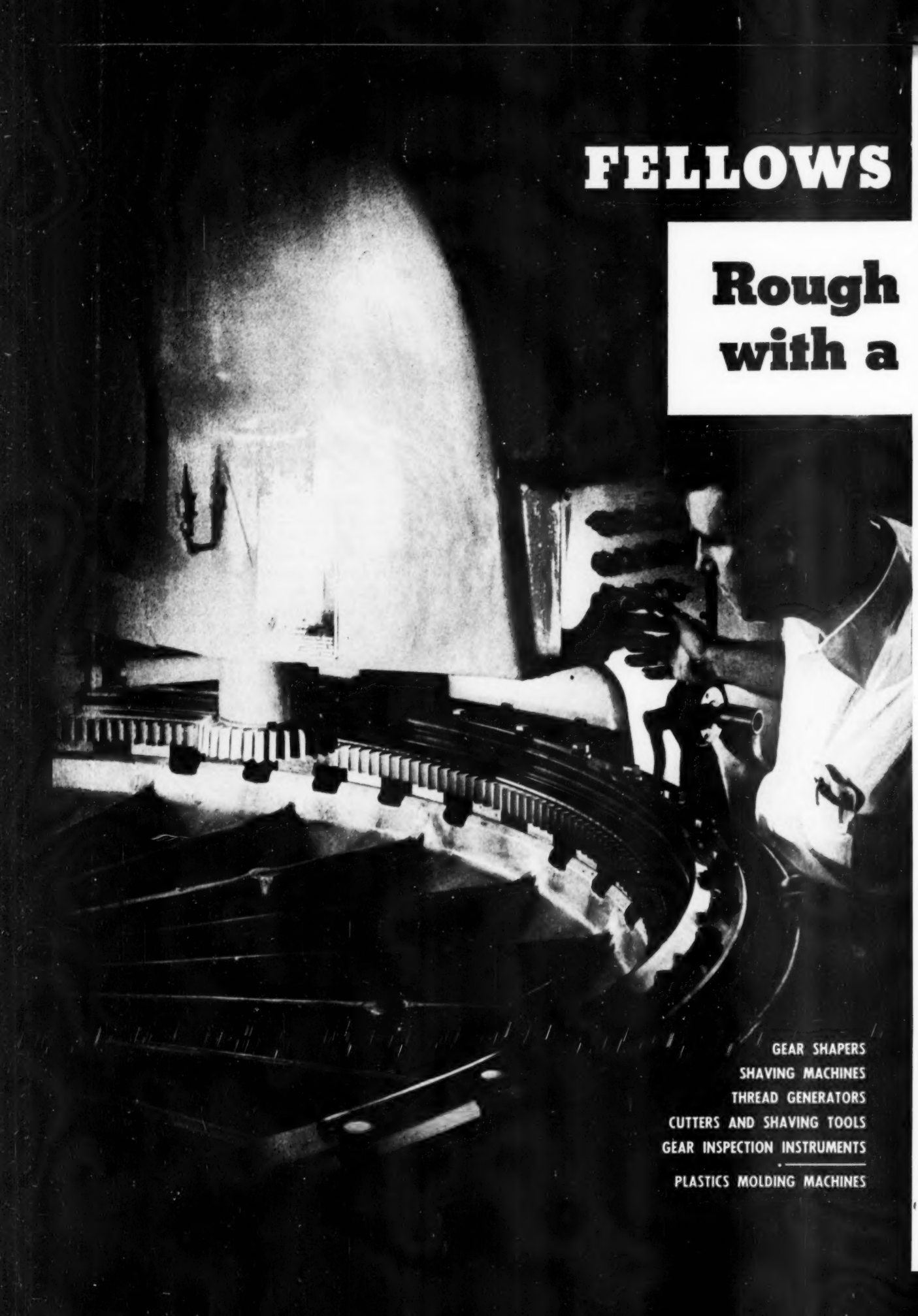


Drawing of part and sequence of feed cycles for milling four surfaces in one setting. Heavy lines indicate milled surfaces.

Part name ... Gear housing
Material ..... Cast iron
Operation .... Mill four surfaces
Depth of cut .. 3/16"
Feed ..... 16" per minute
Cutting Speed 223 feet per minute
Production ... 5 per hour



CINCINNATI Hydromatic Milling Machines are built in plain and duplex styles; 18 sizes of each. Complete data may be obtained by writing for catalog No. M-1670-1.



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120" GEAR SHAPERS

and Finish Single Set-up!

Giant tank turret gears being accurately generated on Fellows 120" Gear Shapers at the Chrysler Delaware Tank Plant.

These gears are roughed and finished in two cuts at one setting of the work. Easily accessible fixtures, rigidly supported, reduce handling time and permit the use of increased cutting feeds to speed production. Tool maintenance costs are low because the cutters can be sharpened on any standard rotary surface grinder.

For speed and fine finish at the lowest practicable cost on either intermediate or larger gears, investigate the Fellows 36-Type, 48-Inch, or 100-Inch Gear Shapers. Write or call the Fellows office nearest you.

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New VAN NORMAN DIVERSIMATIC® CENTERLESS GRINDER

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Diversimatic Does All Conventional Centerless Jobs... Plus Form Grinding

The Van Norman *Diversimatic* is a precision-built centerless grinder that insures fine micro-finishes and close tolerance work at production speeds.

The *Diversimatic* is especially applicable for grinding a variety of small parts such as bearings, drills, valves, shafts, tubes, punches, cap screws and formed parts of two or more diameters or special contours.

The *Diversimatic* is actually three machines in *one*. It is a standard centerless grinder for ordinary throughfeed work . . . a standard grinder for infeed jobs... and equipped with the Crush Forming attachment, it form grinds and does profile work.

Compare These Diversimatic Features!

- Special, easily removable grinding wheel, spindle quill, with combined double-row super precision ball and roller bearings, sealed and lubricated for life assure trouble-free operation.
- Spindle requires no warm-up period
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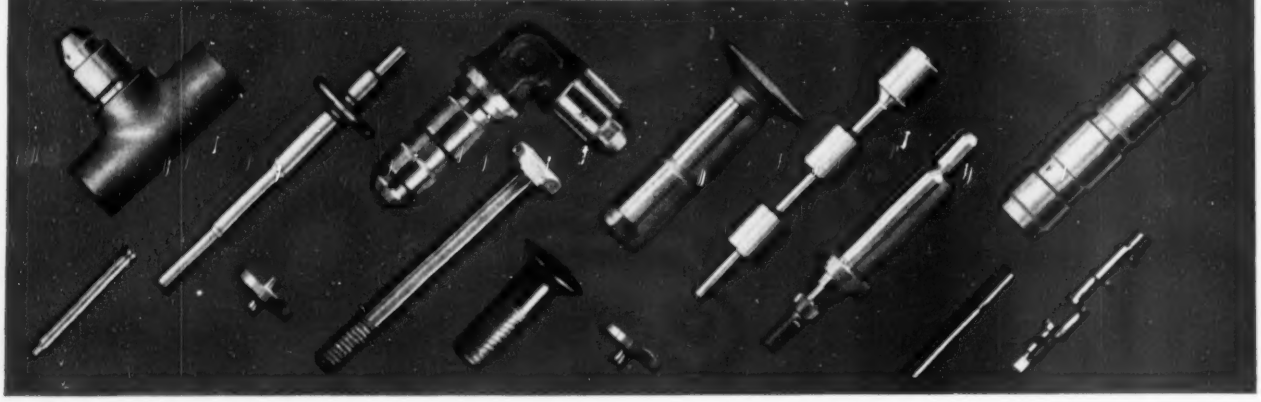
- Infinitely variable ¼ h.p. regulating wheel drive, 30 to 300 r.p.m.
- Large 1⅞" 4 thd. Acme Infeed Screw with full length split type nut to compensate for wear
- Work-Rest adjustable for position; may be fixed across the ways or made to feed in and out with the regulating wheel

Get the full facts on the Van Norman Diversimatic Centerless Grinder. See for yourself how this versatile grinder can cut your grinding costs on small shafts, formed shapes, parts of two or more diameters or special contours.

*Registered trademark of the Van Norman Company

Typical Parts Centerless Ground on the DIVERSIMATIC®



The DIVERSIMATIC Equipped for Crush Forming . . .

A NEW DEVELOPMENT THAT INCREASES THE SCOPE OF CENTERLESS GRINDING OPERATIONS

Now many small, formed parts and multi-diameters can be ground direct from the solid on the Diversimatic with the Crush Forming Attachment. It dresses the wheel to the desired contour and holds the form hundreds of pieces longer between wheel dressings, imparting the exact profile to the work. Also finish grinds rough-turned parts. Grinds faster, holds tolerances, cuts costs.

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SPRINGFIELD 7, MASSACHUSETTS, U.S.A.

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LANDIS ENGINEERS METHODS FOR

1. (Above): A 1½" LANDMACO double spindle machine engineered for threading of V-Belt sheaves is equipped with a 1½" LANCO Head for external threading and a 3ALT tap for internal threading. The complete threading requirements for the work piece are accomplished by one machine and one operator, therefore reducing labor and handling costs.

2. (Right): A special Collapsible Tap used to thread 12" to 18" valve bodies for seat ring insertions. Landis Valve Seat Taps are individually engineered for their particular usage and are supplied to tap valve bodies ranging from the 2" to the 24" size.

4. (Right): A LANCO Taper Cutting Head designed for producing tapered threads up to 2¼" in length and to unusually close tolerances. The die head can be converted to cut a reverse taper by the simple application of a reverse taper cam. Diameters from ½" to 2" and tapers ranging from zero to 2" per foot can be cut with this LANDIS Head.

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WORLD'S LARGEST EXCLUSIVE MANUFACTURERS

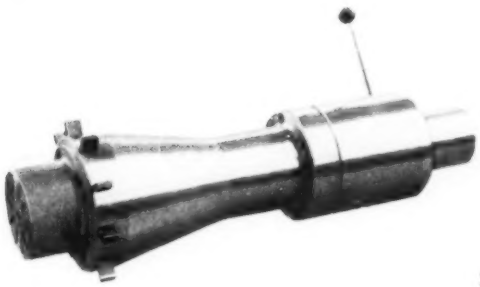
Difficult Threading Jobs?

DEVISE SPECIAL EQUIPMENT AND "HARD-TO-THREAD" WORKPIECES

Don't let the production of an unusual thread hinder an otherwise efficient manufacturing process. Hundreds of companies are today, with *LANDIS* equipment, profitably generating threads formerly considered impossible or too costly for practical operation.

We offer to all manufacturers aid in solving problems in all phases of thread production. We will consult on the original design to insure that the proper thread to best serve a particular function is employed; we will advise as to the best standard equipment to produce a specific thread; we will develop special tooling for the production of an unusual or difficult thread; we will design special holding fixtures for threading workpieces that are difficult to chuck; or we will work out special methods to best fit multiple threading operations into the complete production process.

The illustrations show four examples of such Threading Problems solved by our Engineering Department. No matter what *your* Threading Problem—let our years of Thread Experience and Engineering Know-How work with you in its solution. Write or call *LANDIS* today.



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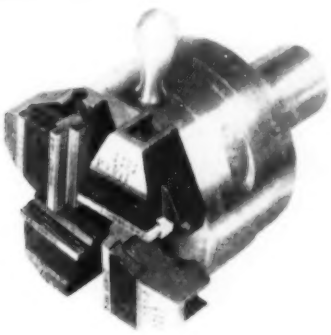
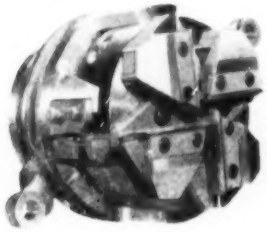


3. (Right). Double Diameter Chasers used to generate threads on reducing bushings and similar work pieces. These chasers cut threads on two different diameters simultaneously; thus, eliminating a second operation. Pitch and thread form for the two diameters must be identical and other limitations necessitate individually designed chasers for threading parts of different dimensions.

3



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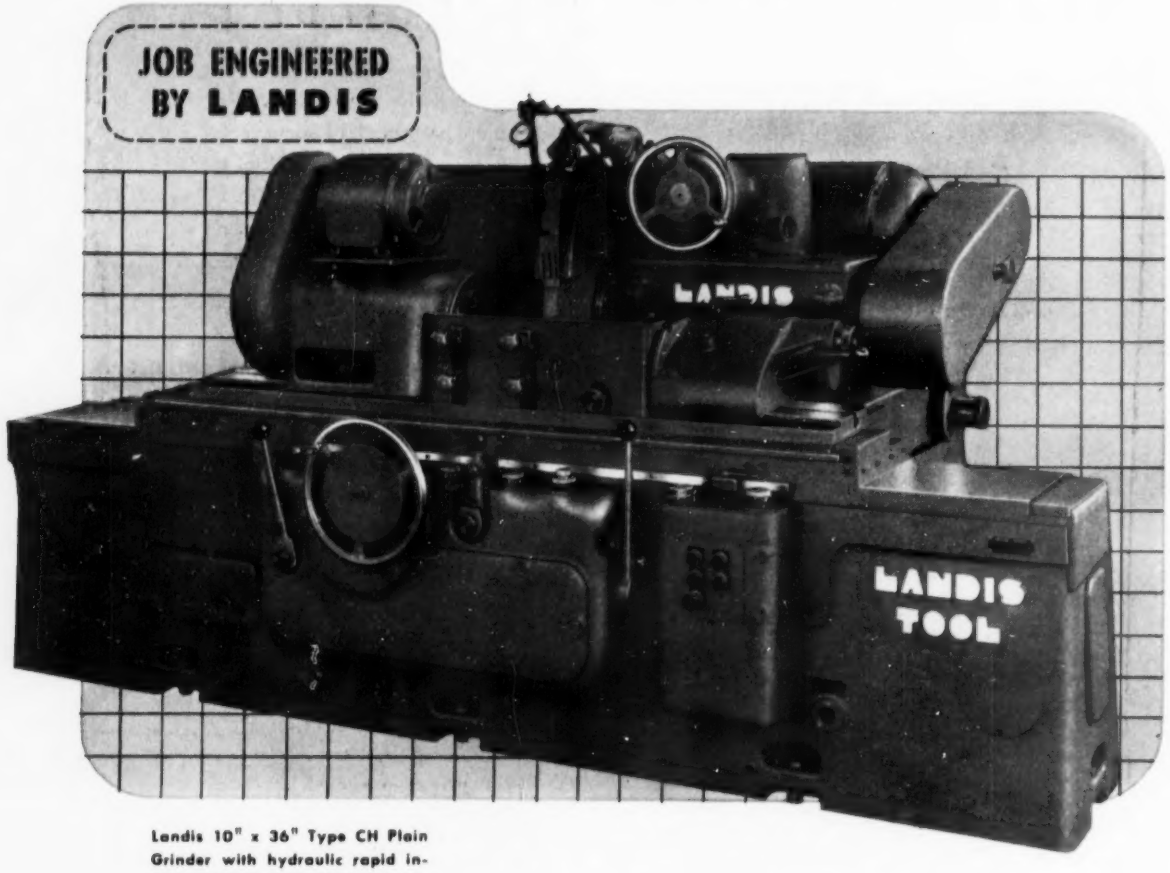
THREAD GENERATING EQUIPMENT

How LANDIS JOB ENGINEERING cuts grinding costs . . .

Automatic Grinding Cycles Reduce Operating Costs . . . Give Better Quality—Sustained High Production



Landis 10" x 36" Type CH Plain Grinder with hydraulic rapid infeed and sequence grinding feeds.

JOB ENGINEERED by LANDIS means grinding ideas that will make your modernization or replacement program pay off. It starts with operator convenience, hydraulic controls and simplified maintenance of a standard Landis grinder. Then, on the basis of your requirements of finish, tolerance and production, we will suggest tooling that will reduce the operating costs of your grinding department.

Landis Job Engineered Grinders give you a fast return on your investment because they're engineered to *your* requirements. Send us prints for tooling and production estimates. No obligation.

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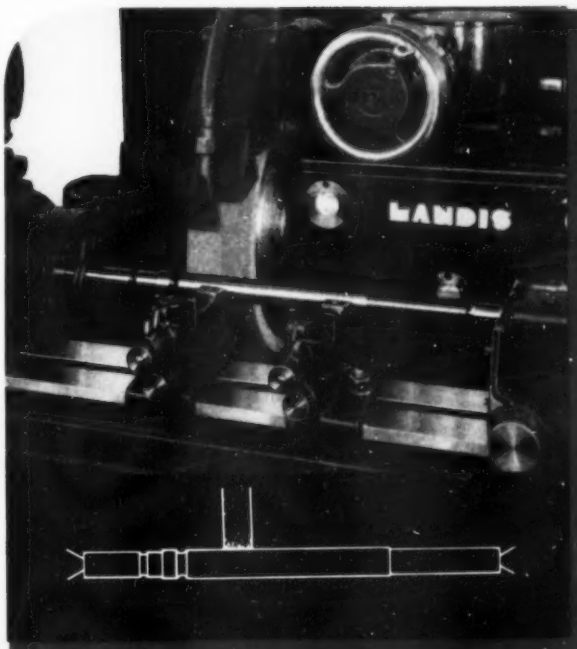
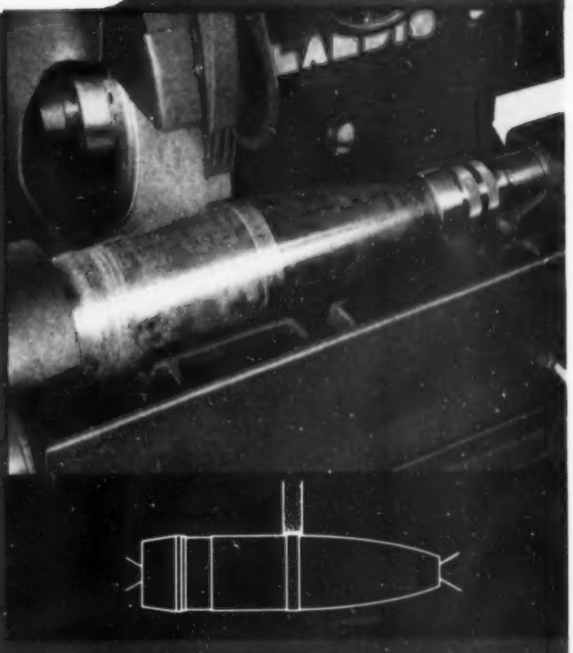
LANDIS

precision grinders

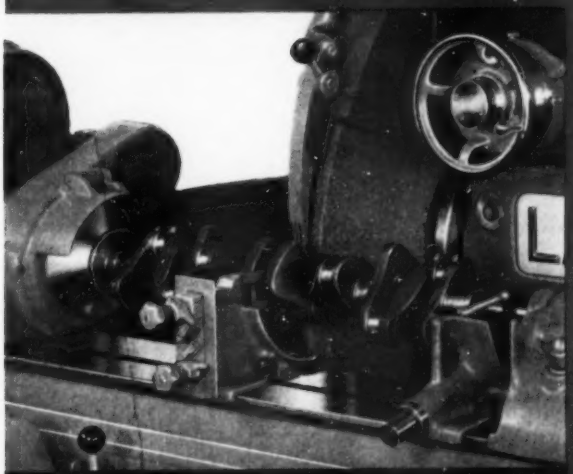
JOB ENGINEERED BY LANDIS

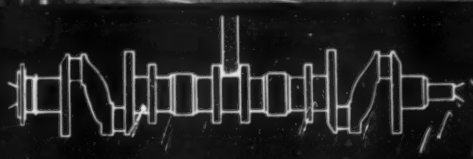


TRAVERSE GRINDING with adjustable wheel feed, at each or either reversal point, to finish size. Feed automatically re-sets.

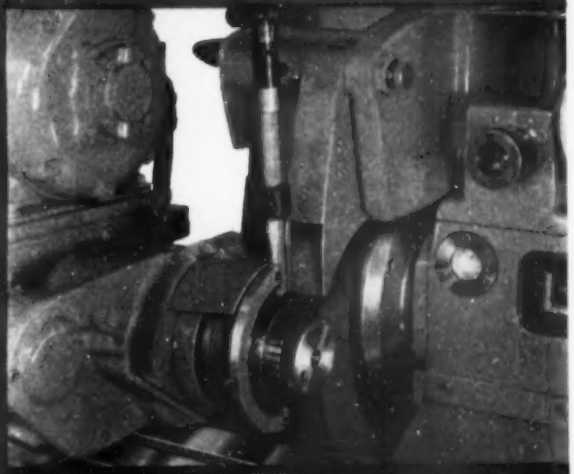


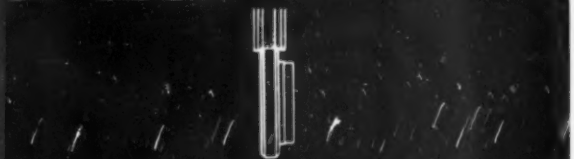
INFEED GRINDING WITH TAPER has rapid approach of wheelhead and adjustable continuous grinding feed after wheel spark-out. Automatic reverse of wheelhead and feed.





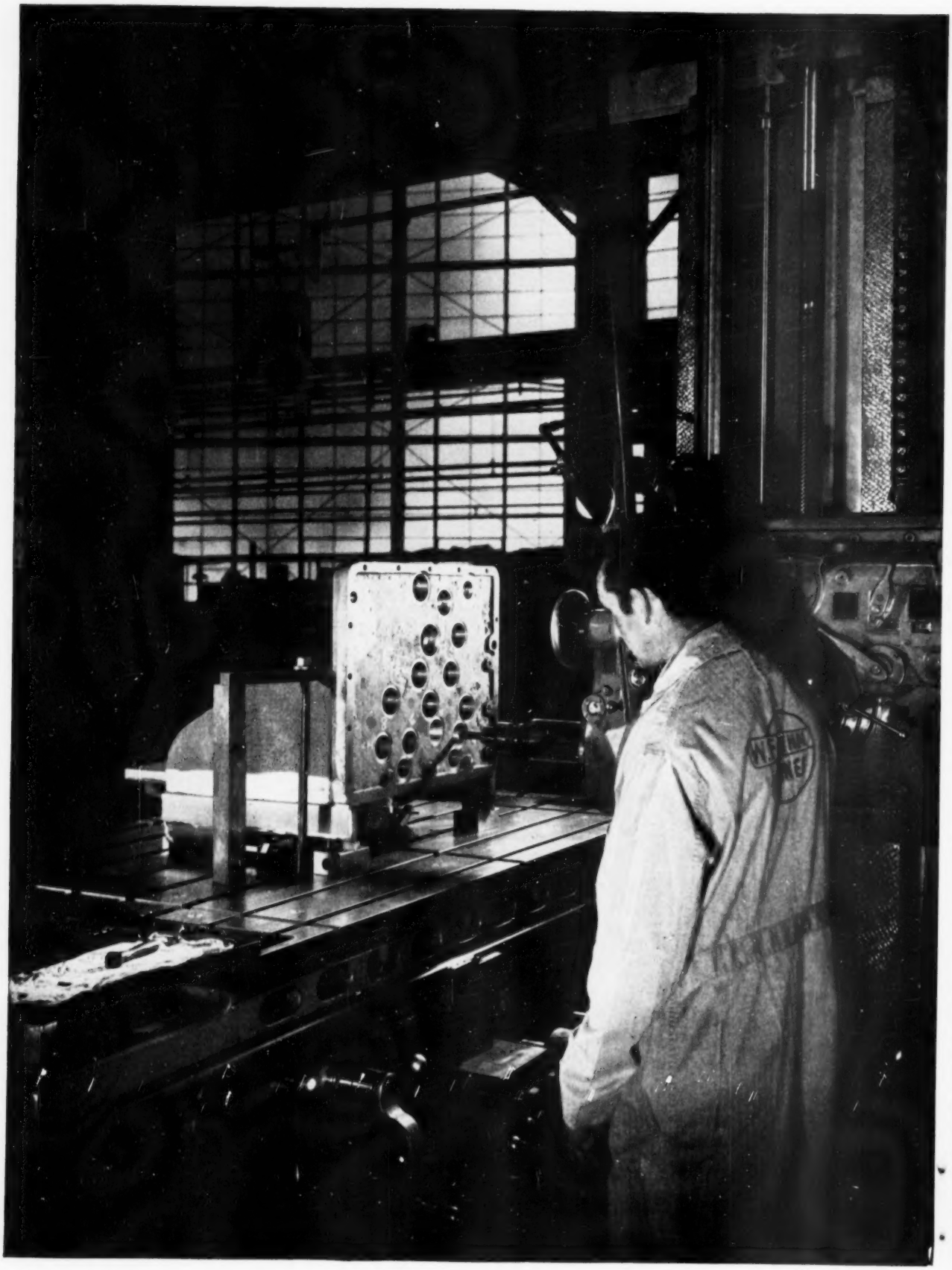
SEQUENCE GRINDING FEEDS for grinding side walls with a different feed rate than used on diameters. All feeds re-set at end of cycle.





AUTOMATIC SIZING combined with straight infeed grinding. Sizing device retracts wheelhead when finished size is reached. Feeds re-set automatically.

LANDIS TOOL COMPANY • WAYNESBORO, PENNSYLVANIA, U. S. A.



Hairsplitting

on a mass production basis!

This workpiece is positioned automatically, bored to limits within .0002", yet handled on a production basis. It's a routine job for the versatile G&L 340-T Horizontal Boring, Drilling and Milling Machine with Automatic Electric Positioning Device.

You can increase the efficiency of boring, drilling or milling operations with this ultra-precision machine. Because of its open construction and outstanding rigidity, the G&L 340-T allows you to handle either large or small work with equal precision on both production and custom run jobs. It's extremely flexible. With it, you can perform multiple operations from a single setup . . . maintain close tolerances and parallelism even though table is fully extended.

Featuring 45 easily selected speeds and 36 feeds, this standard model table-type machine delivers 20 hp, has a 4" spindle, offers a choice of three basic table and saddle arrangements. Standard bed length is 72", headstock travel on the column is 36". Cross-feed of its 36" x 72" table is 60". Larger bed, column and table sizes are also available.

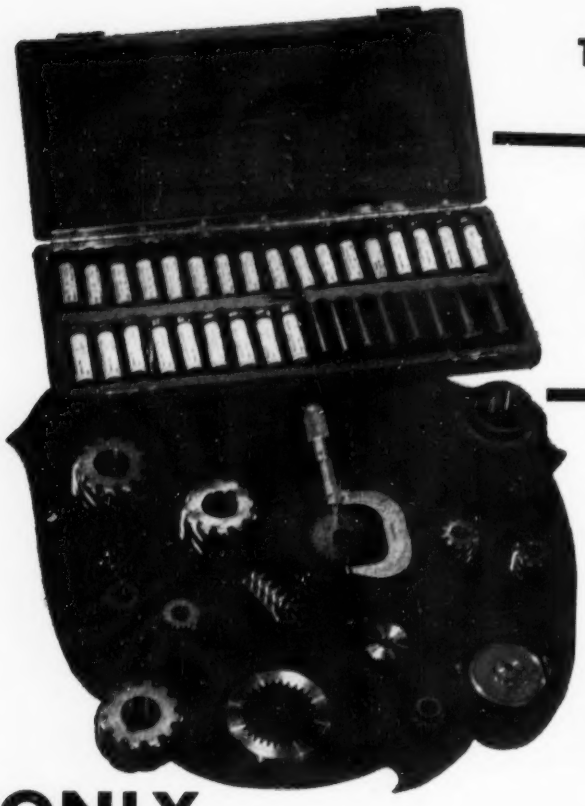
What's more, these versatile machines can be equipped with the G&L Automatic Electric Positioning Device. This unit eliminates many time-consuming hours for final hand adjustments for locating work. That's because it automatically controls table and headstock movements to precise, pre-determined settings.

For complete information, see your G&L representative or write ———

GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

Photo courtesy of
The W. F. & John Barnes Co.



THE Van Keuren GEAR MEASURING SYSTEM

Set 26EX—Gear Measuring Wires, accurate to ± .000025", for common diametral pitch external spur gears.

VAN KEUREN GEAR MEASURING WIRES PROVIDE THE MOST ACCURATE AND LOW COST METHOD OF MEASURING THE TOOTH THICKNESS OF SPUR AND HELICAL GEARS, INVOLUTE SPLINES AND INVOLUTE SERRATIONS.

ONLY . . . EQUIPMENT NEEDED:

1—SET VK MEASURING WIRES
1—MEASURING INSTRUMENT

Complete information regarding the use of Gear Measuring Wires is contained in a 50-page section of the Van Keuren CATALOG and HANDBOOK No. 35. Included in this section are:

- . . . table of wire sizes for the 1.92", 1.728", 1.68" and 1.44" series.
- . . . tables of wire measurement including change factors for standard external and internal spur gears of 14½°, 17½°, 20°, 25°, and 30° pressure angles and of from 5 to 500 teeth.
- . . . table of relationships between depth of cut and tooth thickness for common pressure angle gears.
- . . . definitions and exact formulas covering involute spur gears.
- . . . tables of involute tooth parts for standard addendum and stub tooth involute gears.
- . . . information, formulas and examples regarding the wire measurement of helical gears.
- . . . information and examples concerning the wire measurement of enlarged pinions and reduced gears.
- . . . tables of wire measurement for involute splines.
- . . . tables of wire measurement for involute serrations.
- . . . tables of comparative measurement over three sizes of wires for use in involute profile checking.

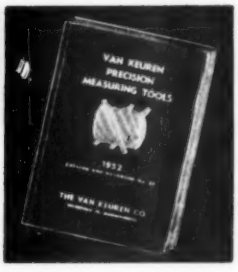
CATALOG and HANDBOOK No. 35 is available without charge by writing to: The Van Keuren Co., 173 Waltham St., Watertown, Mass. Ask for your copy.

VK
34th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires



No. 3 in a Series

Conomatics demonstrate carbide tools

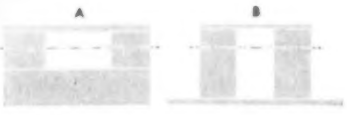
We believe you know that not every "automatic" job can be tooled successfully with 100% carbide. What we think you may not know is that the Conomatic Carbide Development program is making progress with such jobs. This relatively new Cone service is convincing to those who like to be shown that "it can be done".

Granted that experimental runs are not production runs, it has often been proved that under actual production conditions they have developed into production runs. A number of conditions must be met in the successful use of any tooling material. Carbide is no exception. If the comparisons of 100% carbide and HSS runs indicate as much gain as per the job illustrated, the reward is worth the effort.

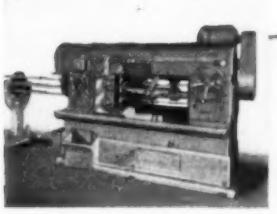
For full particulars please consult your Cone Representative or inquire direct.

MATERIAL—EVERDURE: (96% copper, 3% silicon, 1% manganese) Hole drilled with 17/32" drill to 1½" depth; thread rolling of ½" pipe thread.

	HSS	CARBIDE
Cycle Time	35 secs.	15 secs.
Work Spindle Speed	420 R.P.M. at 124 S.F.	850 R.P.M. at 250 S.F.
Tool Wear	2000 pcs. per grind	5000 pcs. per grind

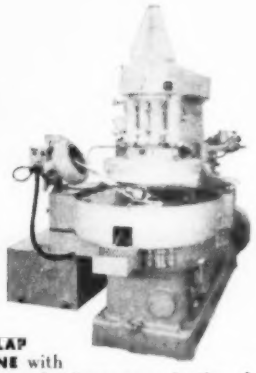


The CONOMATIC is the ONLY representative of Frame "A". The short, "weave-proof," upright members, secured between larger and heavier top bed and base, make possible the strongest type of bridged support to the tooling area and its "work and tool axis."

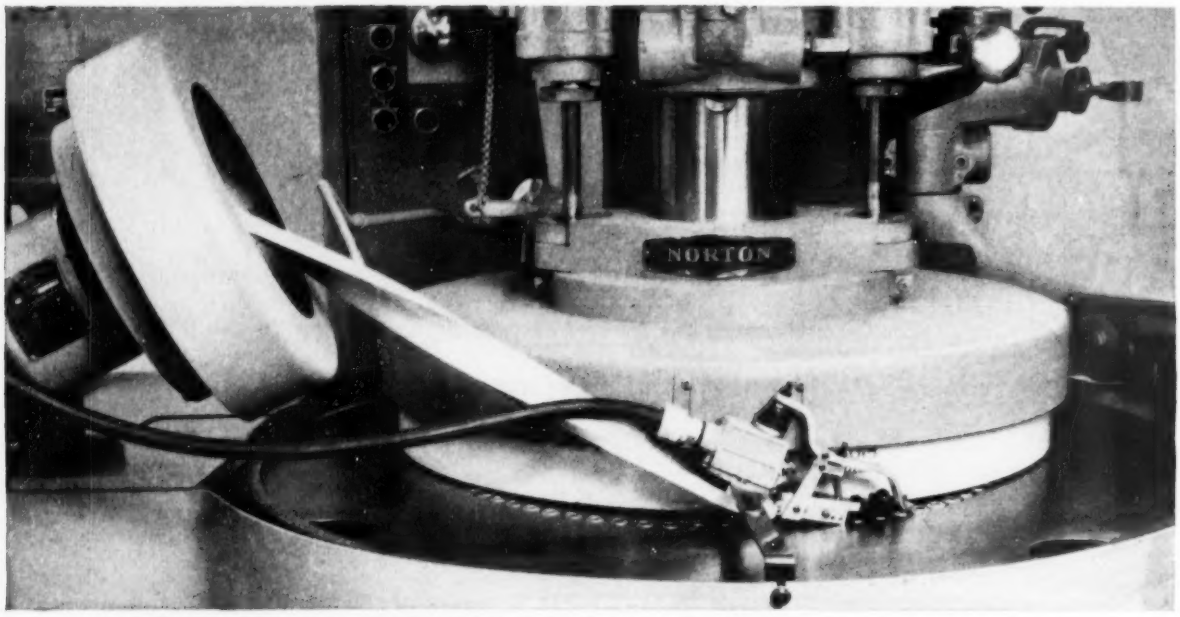


Conomatic } CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

Norton Thru-Feed Lapper gives you the "TOUCH OF GOLD" for small, flat parts



NORTON 26 HYPROLAP LAPPING MACHINE with automatic loading features that increase production of small, flat parts difficult to handle manually as much as 4 to 1 . . . as many as 8000 pcs/hr.



AUTOMATIC LOADING ARRANGEMENT of Norton 26 Hyprolap lapping machine makes sure parts are in correct position before entering feeding trough . . . prevents ganging up . . . directs work in a path that assures even lap wear.

NEW, built-in automatic loading adds extra advantages to Norton 26 Hyprolap*

You can make 4-to-1 savings in lapping small, flat parts . . . by adding the "Touch of Gold" that adds to profit by cutting costs. Investigate new Norton 26 Hyprolap lapping machines with the exclusive built-in thru-feed mechanism.

Here's why:

1. You speed up production. Loading and lapping operations handle parts as fast as 8,000 pieces per hour.

2. You cut handling. Loading and unloading are completely automatic.

3. You reduce downtime. Work path traverses the entire working surface of each lap . . . promoting even wear . . . reducing the frequency of lap dressing.

4. You cut out operations. This lapper removes stock down to .0002" tolerances . . . makes surfaces parallel to .000025" . . . in many instances without pre-grinding of parts.

5. You use less skilled help. Filling feed hoppers and removing finished-work baskets are the only manual operations.

No wonder 4-to-1 savings are a matter of record with the new Norton Hyprolap with built-in automatic loading!

Send for Bulletin 852-7. Also submit samples of your work for production estimates. Standard hopper-feed Hyprolap machines take work up to 1¼" diameter. Modifications handle larger work. NORTON COMPANY, Machine Division, Worcester 6, Mass.

To Economize Modernize With **NEW**

NORTON

GRINDERS and LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit

*Trade-Mark Reg. U. S. Pat. Off.

Norton announces...

Your product parts will perform better — and gain in value — when the product-improving "Touch of Gold" is added in Norton's new Job Lapping Department

A new, enlarged job lapping service

Now you can improve your product quality with precision lapped parts!

The new Norton Job Lapping Service is ready to help you improve product quality and performance — by furnishing parts to your exact specifications.

Complete and modern in every detail, the new department is manned by expert personnel, operating Norton machines for every type of lapping. Results are checked on the latest electrical and optical inspection equipment, while precision accuracy is further assured by careful atmosphere control. The scope of jobs that can be handled is broad, covering:

Materials — Practically unlimited in range, including hardened steel, stainless steels, stellite facings, cast iron, nonferrous pressed and die-cast parts.

Types of Lapping — Single and parallel face flat lapping, to specifications ranging from stock removal to optical flatness. Also, external cylindrical lapping to high precision requirements.

Workpiece Capacities — Flat work up to 24″ across. Cylindrical work from 1/16″ diameter by 1/2″ long to 2″ diameter by 8″ long.

Meeting Your Needs Exactly — The entire project is under direct supervision of Norton Lapping Engineers, pioneers in the development of mechanical lapping processes and machines. They are prepared to work out the best lapping techniques for your requirements. For full details, see your Norton Representative or write us direct. NORTON COMPANY, Machine Division, Worcester 6, Mass.

***To Economize, Modernize With* NEW**

NORTON

GRINDERS *and* LAPPERS

Making better products... to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit • *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5

PRODUCTION TIME

PRODUCTION DATA

PART — QUICK CHANGE CLAMP COLLAR
MATERIAL — SAE 4615.
CUTTER — ¼ dia. — 2 lip — HSS endmill.
SPINDLE SPEED — 600 rpm — (80 sur. ft./min.)
LOT SIZE — 25 to 50 pcs.
CYCLE TIME (FLOOR TO FLOOR) — 15¾ minutes.
PREVIOUS CYCLE TIME — 34 minutes.

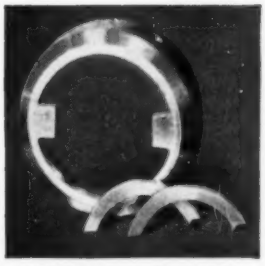
(A) 6" (B) 4⅝" (C) 3¼"
(D) —1" + .000 (E) —1" + .005 (F) ⅜"

OPERATION 1 — Rough mill one side of tongue.
PROCEDURE — Offset spindle slide radius (A), set rotary head to angle (B), feed table to workpiece centerline (C to D).

OPERATION 2 — Rough mill radius section between tongue.
PROCEDURE — Rotate head from angle (B) to angle (E).

REDUCED BY 53%!

Rotary Head Milling Machine simplifies method and cuts costs on still another production job



Here's the completed workpiece together with two pieces of waste.

IN production of this Quick Change Clamp Collar, considerable savings were effected by using a versatile Kearney & Trecker No. 2 Model D Rotary Head milling machine.

The radius of the piece was produced merely by offsetting the spindle slide and rotating the machine's head. The job was done faster, more accurately than would be possible with any other method.

Practically no other standard machine can mill these parts without a change in setup and cutters, maintain accuracy, yet complete the job in less than 16 minutes!

For details of this operation, see the diagrams below. Note: Model D's table and saddle movements are independent, will not affect the radius setting—think what that means not only to this job, but also in terms of a wider range of applications for other work.

Here's the Rotary Head Milling Machine Production Idea Booklet. It contains several examples of how this method has been found exceptionally efficient in solving production, die, forging and metal pattern milling problems. It's yours for the asking.

Address requests for booklet to Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

OPERATION 3— Rough mill one side of opposite tongue.
PROCEDURE—Feed Machine table from (D) to (F).

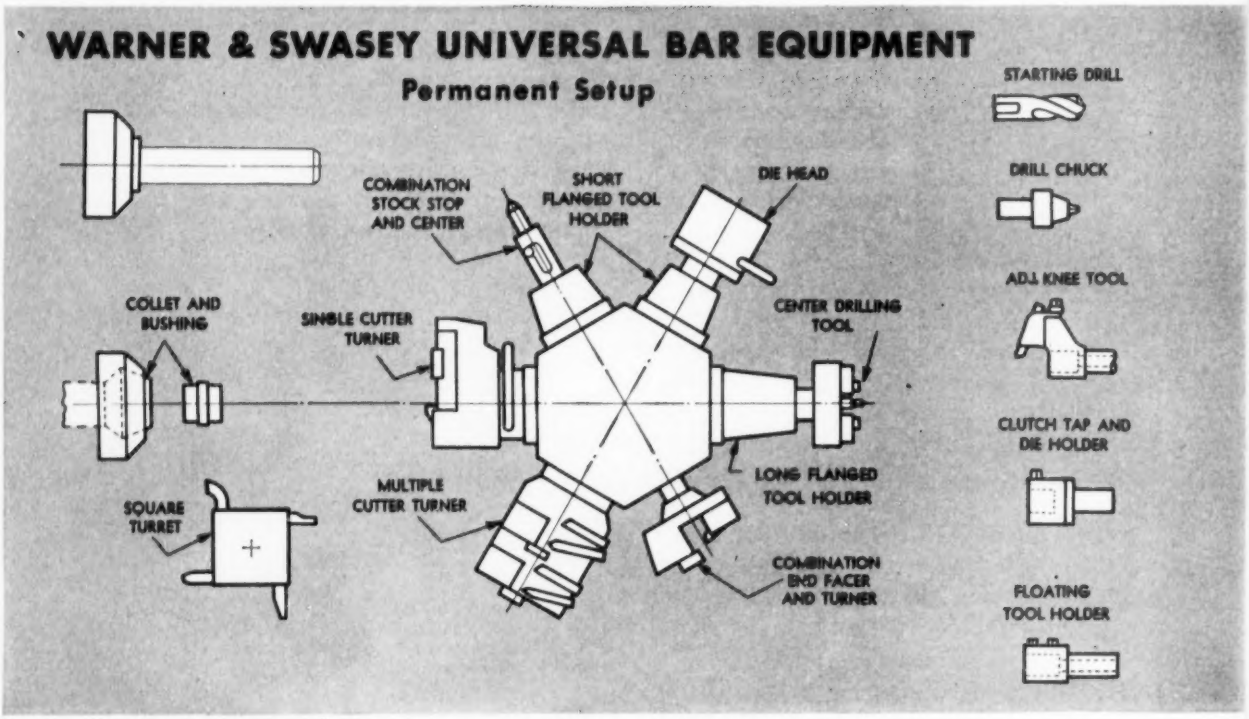
OPERATION 4— Rough mill end of tongue.
PROCEDURE—Feed machine saddle from (F) to (G).

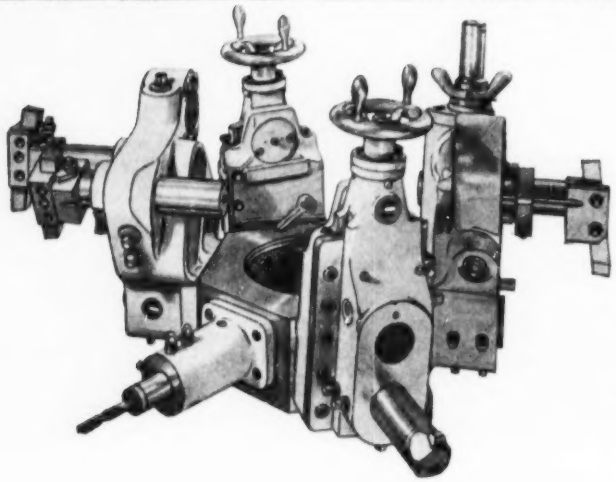
OPERATION 5 — Rough mill second half of inner contour.
PROCEDURE — Repeat Operations 1 through 4, working area to be in the lower half of opening.

OPERATION 6 — Finish mill 4⅛" dia., end of tongues to 3¼" dimension and width of tongues to 1" + .000 —.005.
PROCEDURE — Reverse sequence of Operations 1 through 5.

Use Warner & Swasey

Speed up–Simplify





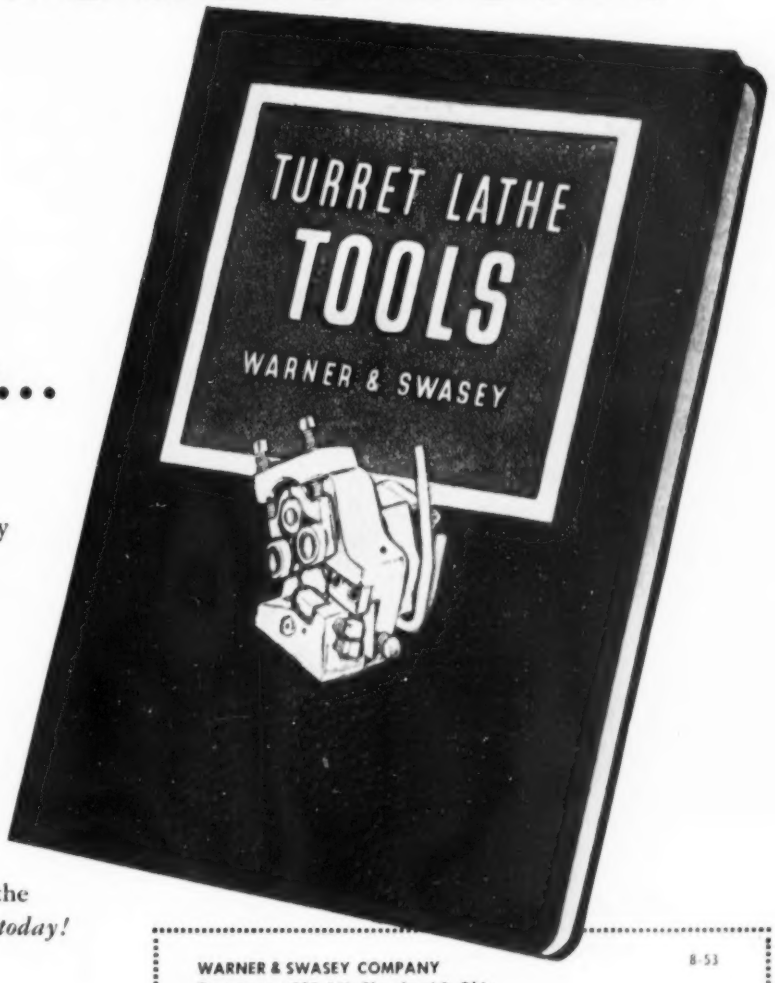
The advantages of Universal Tooling Set-ups are described in TURRET LATHE TOOLS *along with full information on the most complete line of bar and chucking tools.*

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

Standard Tools to...

Your Production!

This free book tells you how...



Yes, *you* can make Warner & Swasey standard turret lathe tools and Universal Tooling Setups *pay off*—with increased production, less setup, handling and cutting time, longer tool life. This free book clearly and simply explains how to select tools and improve setups, combined and multiple cuts, and many other modern tool applications. Fill in and mail the handy coupon for your free copy—*today!*

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

WARNER & SWASEY COMPANY 8-53
Department 320-AM, Cleveland 3, Ohio

Please send me my free copy of "Turret Lathe Tools" today!

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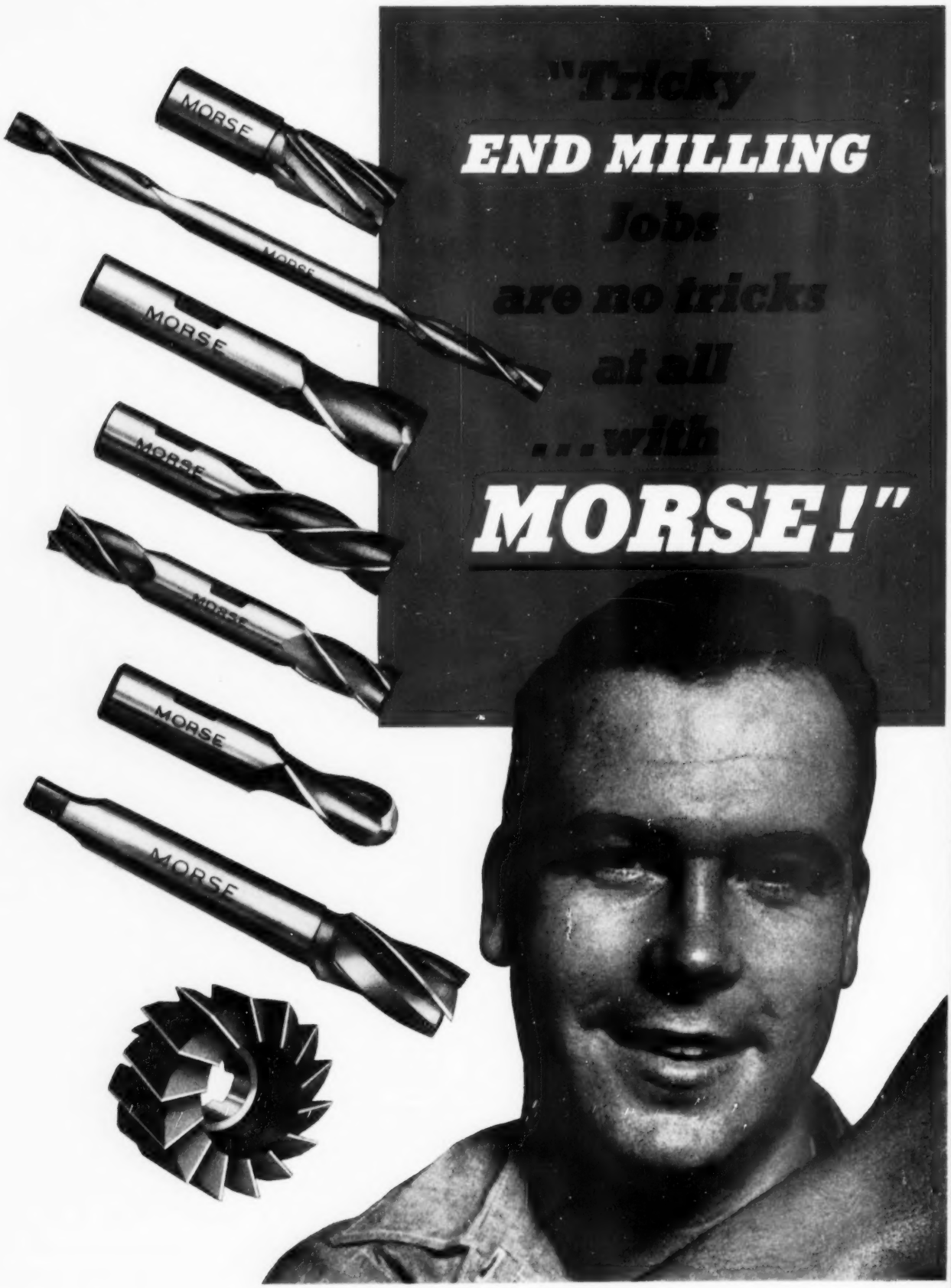
MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY


"Tricky
END MILLING
Jobs
are no tricks
at all
...with
MORSE!"
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A lot of *standard* Morse End Mills would be specials in anybody else's catalog!

Want them short and stubby, or long and lean? Or with ball-end for die cavities, fillets, and round-bottomed holes and slots? Or with *left*-hand spiral but *right*-hand cut to push chips ahead? Morse makes all these, *and more . . .*

For instance, Morse also makes them with two flutes, cleared to cut to center for plunge-cutting . . . with taper shanks to fit machine spindles . . . and in shell types for face or slab milling cuts. Not to mention a complete size-range in the exclusive shear-cutting design known as Morse Hi-Helix.

So if you want an end to your end-mill problems, get hold of your Morse-Franchised Distributor. He has every type you could possibly need . . . and he knows how to engineer it to your job. *Call him now.*

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
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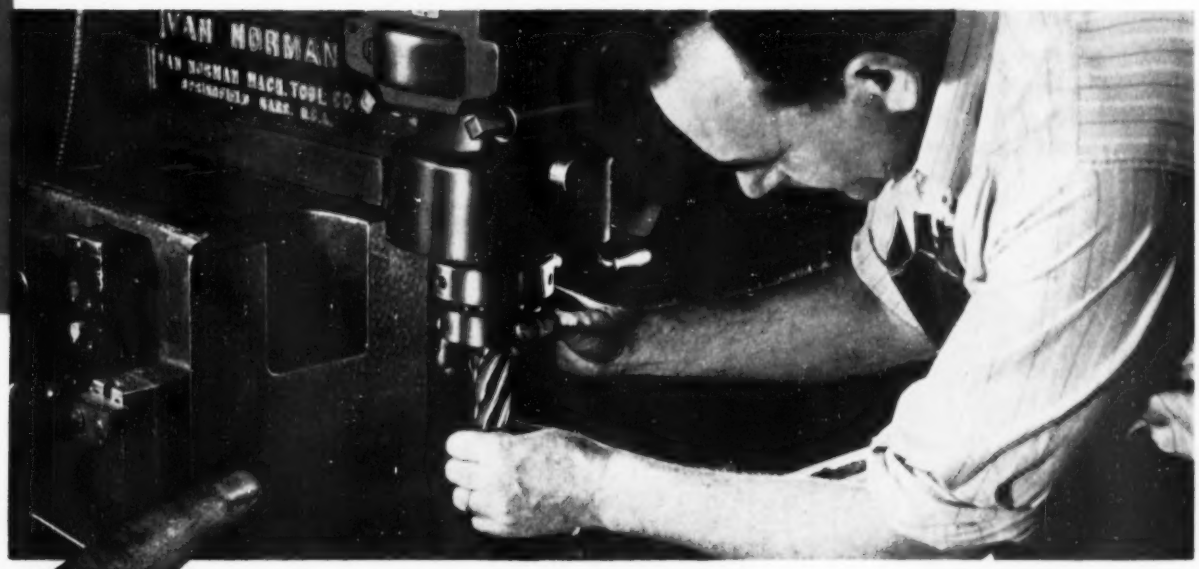
Warehouses in New York, Chicago, Detroit, Houston, San Francisco



MORSE
Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

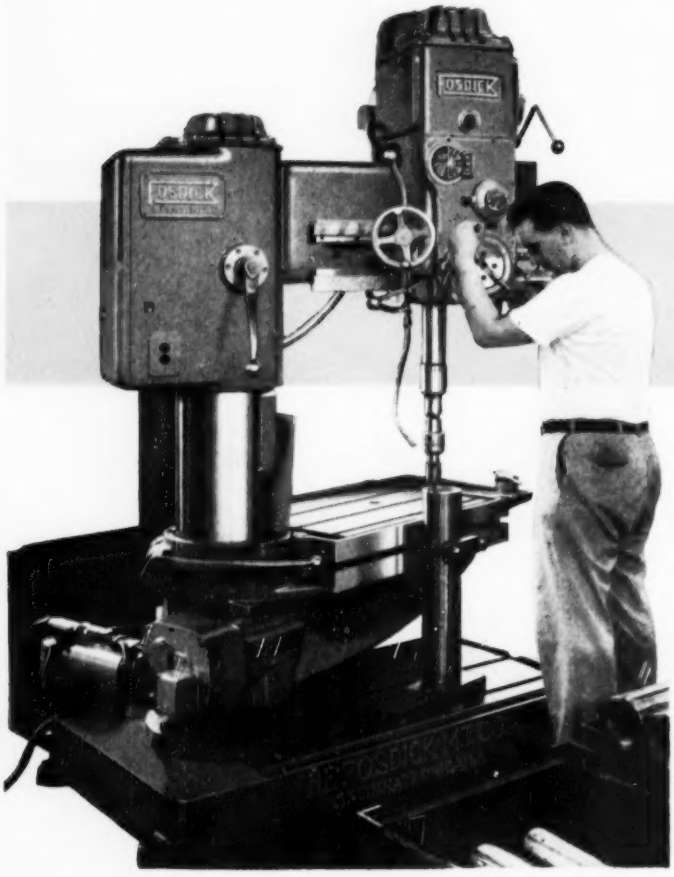
Here's another reason it pays to get a proposal from Fosdick

We put a table on the

When Fosdick engineers put a table on the radial, a unique and basic machine tool was born. This machine combines the best features of two proven, reliable designs. It gives you the capacity and flexibility of a radial—the rigidity, compactness and convenience of an upright. It's the machine you need when you want versatility and economy in limited floor space.

The arm of the Sensitive Radial swings 360° on the rigid one-piece column. Controls are always at the same convenient height. Work is placed on the adjustable table, *or* on the base with the table swung out of the way. Drills up to 1½". 12" column, 3' or 4' arm, nine speeds, four feeds, 3 hp motor, reversing motor control for tapping.

For full information on the Sensitive Radial, ask for Bulletin SRA

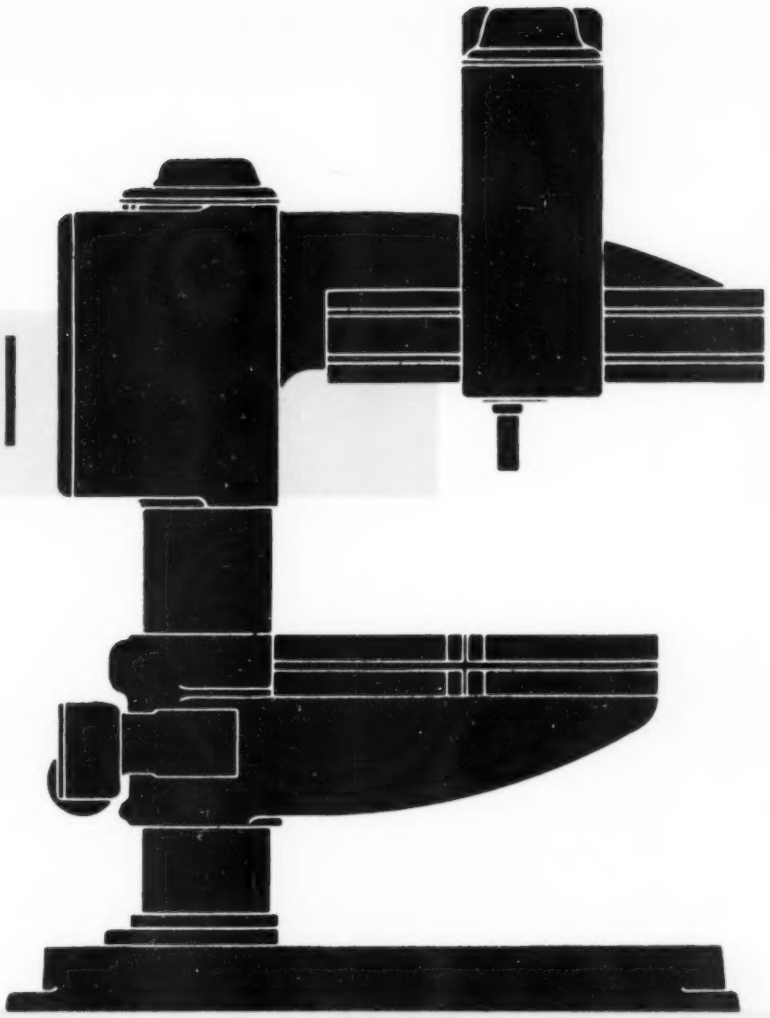


to give you

Variety problem solved at Lodge & Shipley

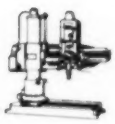
Building 46 lathe models from 14" to 60" requires plenty of production versatility. To drill and tap a broad variety of vari-shaped parts, *Fosdick's proposal* recommended the Sensitive Radial. Now Lodge & Shipley assigns tool blocks, levers, cam plates, spindles and many more complex parts to their Fosdick, knowing it will produce fast and easily. *Operation illustrated:* Tailstock spindle clamped to table vee. Drill, chamfer and tap 4 holes. 17/64" drill, 1020 rpm, .004 ipr, 7/8" deep. Chamfer, 1020 rpm. Tap 5/16" x 18 thread using Automatic Tapping Control (extra equipment), 240 rpm, 1/2" deep.

radial



versatile production like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

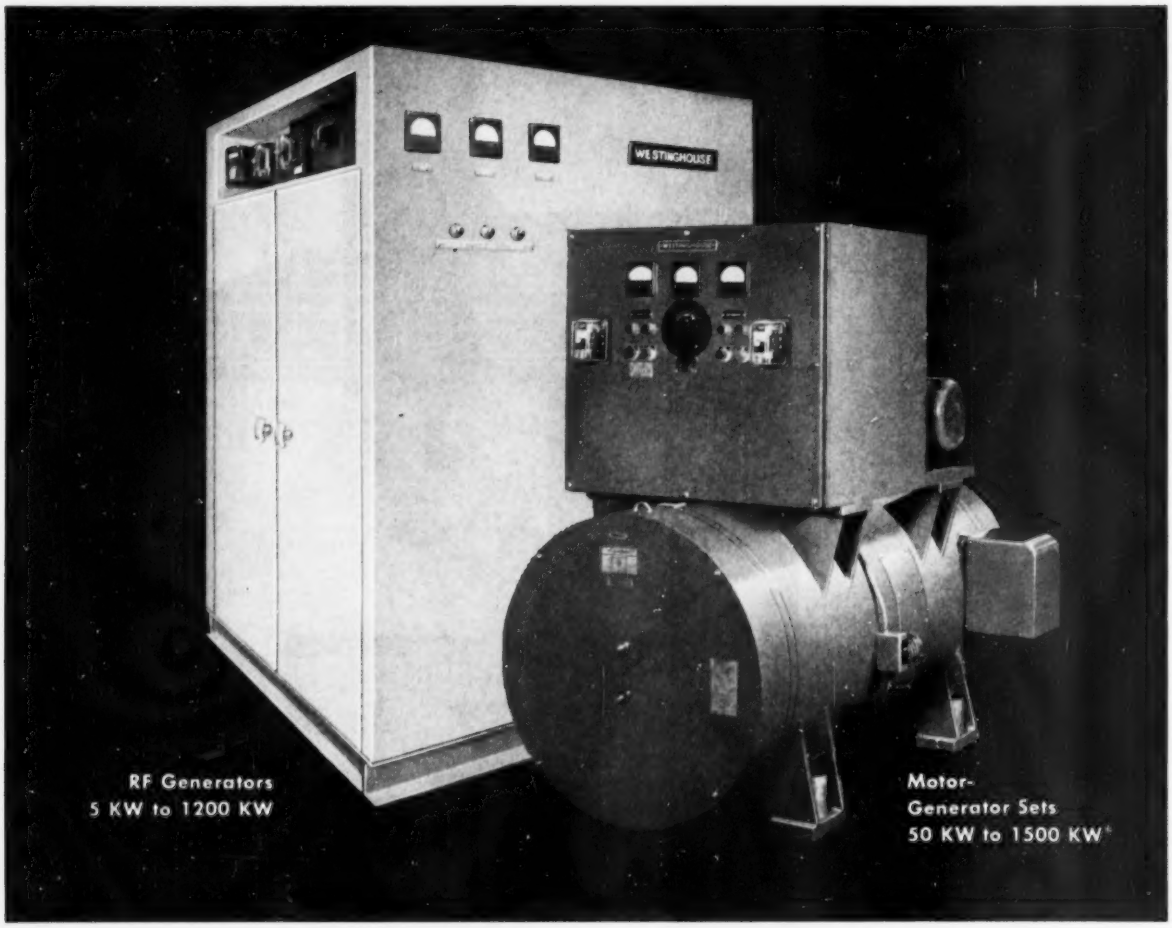
Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO



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Leader for Years in Total KW in Use—Years of experience gained by Westinghouse from hundreds of induction heating installations throughout industry can be applied now to your own heat-treating needs. You are assured of reliability — proved by the fact that the total kilowatt-hours generated by installed Westinghouse induction heating equipment has exceeded, year in year out, that of any other manufacturer.

And you know that Westinghouse, as a manufacturer of both motor-generator and radio-frequency-generator induction heating units, is in a position to recommend equipment without bias for your specific requirements. Whatever your heat-treating problem, inquire about these efficient, versatile tools now. Call your Westinghouse representative or write: Westinghouse Electric Corporation, Electronics Division, Induction Heating Section, 2519 Wilkens Avenue, Baltimore 3, Maryland.

**Higher ratings can be supplied for any specific purpose.*

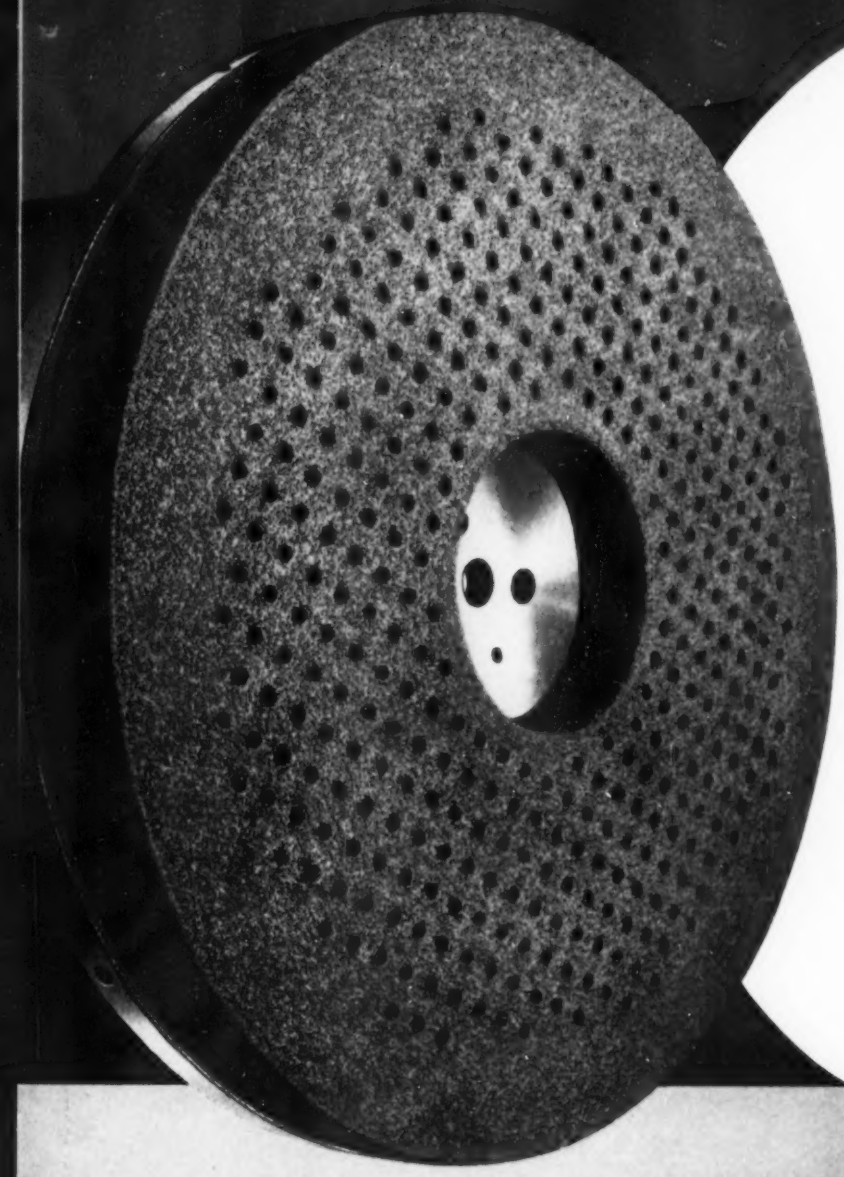
J-02271

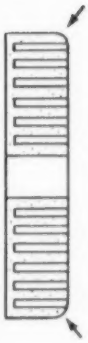
YOU CAN BE SURE...IF IT'S

Westinghouse

Gardner Abrasive Engineering

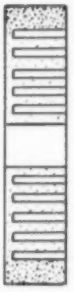
Combining two grades in one disc reduces costs and gives longer disc life





THE PROBLEM

To maintain a flat, true surface on the abrasive disc. Use of a single grade with deep corrugated face proved unsatisfactory. Outer edge of disc wore rapidly in shear cutting operation. Result: a tapered disc face, poor accuracy, frequent dressing.



THE SOLUTION

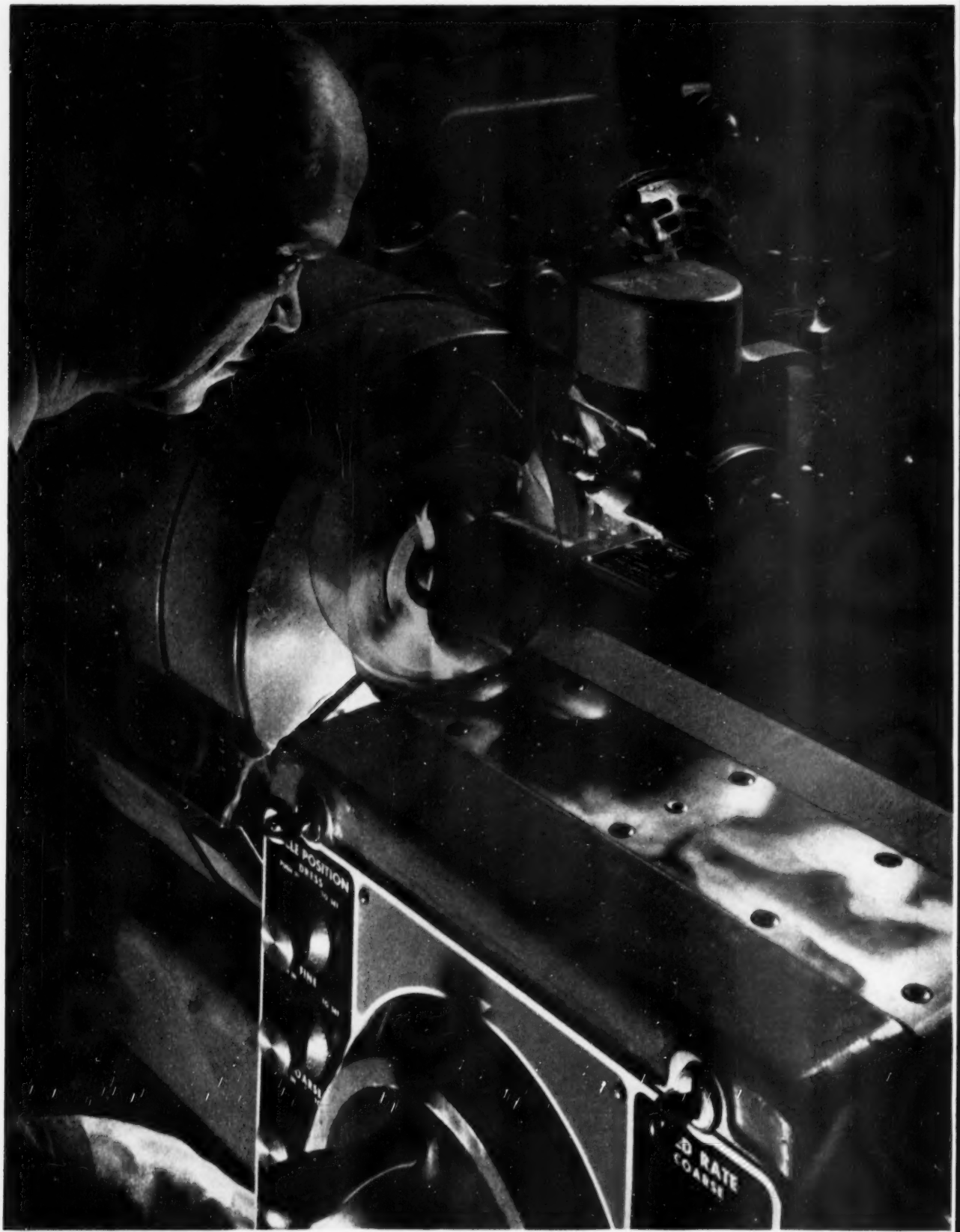
A harder grade was used for shear cut on the smooth outside area and a softer grade for the corrugated area on the inside. Result: Maximum stock removal with fast, cool cutting. Tolerances improved. Discs required less frequent dressing—lasted longer.

Gardner Abrasive Engineering offers experience derived from making both the grinding machines and the abrasive discs. It considers machine performance first and then evaluates how grade and grain of abrasive or type of disc affect grinding results. If standard abrasive discs won't do the job, discs are made *just for you.*

For help with your grinding problem, consult the Gardner Abrasive Engineer. 112A

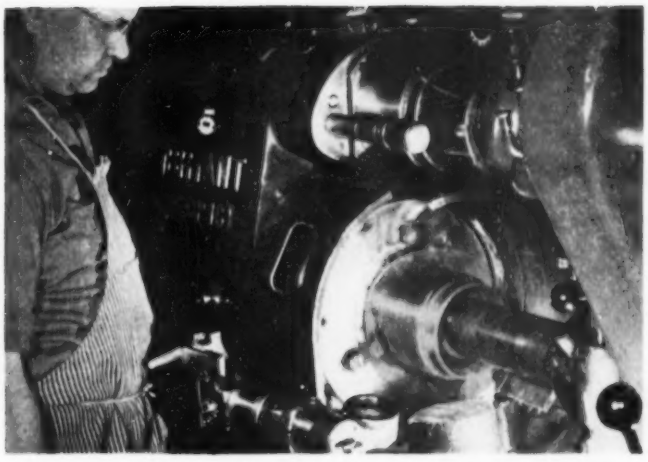
GARDNER MACHINE COMPANY
414 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER
abrasive discs



High production hits its peak when the "Touch of Gold" is added with Norton G Bond wheels for internal grinding.

Precision-processed for identical top performance, Norton G Bond wheels help cut costs on this centerless internal grinding job.



A *faster, better* finish on this aircraft engine cylinder is assured. Norton G Bond internal grinding wheels are on the job!

Step up your internal grinding... boost your profits...with this new

"TOUCH OF GOLD"

Norton G BOND wheels are precision-processed for identical precision-performance

If you haven't tried the new Norton G Bond wheels you have a real thrill coming!

In the first place, these wheels are built by Norton's exclusive method of *precision-processing*.

This brings you wheels so completely uniform in structure that you can just pull off a worn out wheel and slip on a new one knowing you'll get exactly the same grinding action you had a few seconds before, the day before or the week before. Eliminating the fussing with the timing cycle, they save you time and money on every job.

Added to this, the new Norton G Bond, designed for precision and semi-precision grinding, is one of the greatest advancements in vitrified bonds ever made. Holding each abrasive grain for maximum cutting action, it lets go just when it should — assuring a constant grinding surface of fresh, sharp cutting edges.

Top performers . . . all the way

As a result, Norton G Bond internal wheels are exceptional in every detail of operation. They cut cooler . . . remove material faster . . . produce a better finish . . . produce more pieces per dressing . . . hold their shape better. In your internal grinding these advantages add the true "Touch of Gold" that means more accurate work, better products and lowered costs.

Thoroughly job-proved

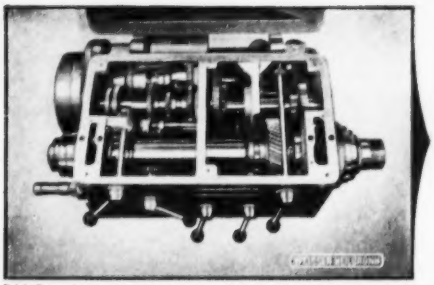
Performance tells the story. Here are some typical reports from internal grinding customers after switching to G Bond wheels: *Total pieces per wheel jumped from 200 to 400 . . . Twice as many roller bearing races ground per dressing . . . Grinding cycle reduced from 7/10 minute to 4/10 minute, with pieces per dressing increased 50% . . . Pieces per dressing increased from 9 to 15.*

See your Norton distributor

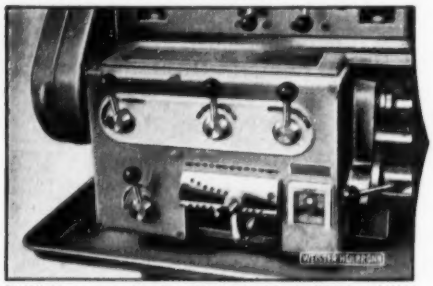
for further facts on how this value-adding, profit-boosting "Touch of Gold" can be brought to your own internal grinding applications. He'll be glad to arrange a test in your plant. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities — listed under "Grinding Wheels" in your telephone directory yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass.

W—1505

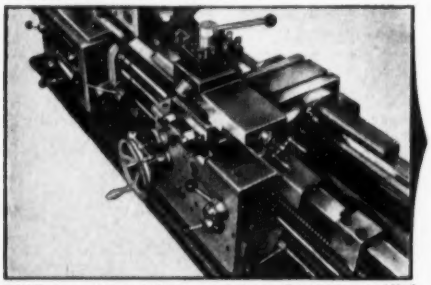
NORTON
ABRASIVES
Making better products... to make other products better



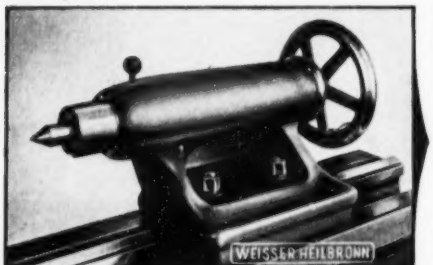
DLNE headstock with opened cover – Very sturdy spindle, hardened and lapped at bearing points – All gears and sliding wheel shafts of chrome nickel alloy steel, hardened and precision ground.



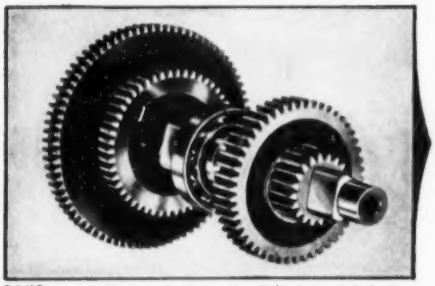
DLNE Norton gear box for 28 longitudinal feeds .00315" to .04724" 28 cross feeds .00118" to .01890" – 42 metric threads, 0.5 to 56 mm – 43 Whitworth threads, 2 to 28 threads per inch – 26 modulus threads 0.25 to 14.0 – 66 diametral pitch threads 1 to 112. Gears need only be shifted for modulus and diametral pitch thread cutting.



DLNE apron with patented drop-worm release – Release accuracy .0004" – Cross slide provided with T grooves permitting mounting of form tools and cutting-off tools.



DLNE tailstock – Honed tailstock bore (superfinish) – Very sturdy sleeve of 3" ⌀ – The sleeve shows an inch graduation to facilitate boring work.



DLNE gears – No more hexagon spline shafts, but exclusively those with patented triangle (A) profile. This makes displacing of wheels impossible while machine is running, prevents gear breaks and extends lifetime of lathe.

Increase your Production

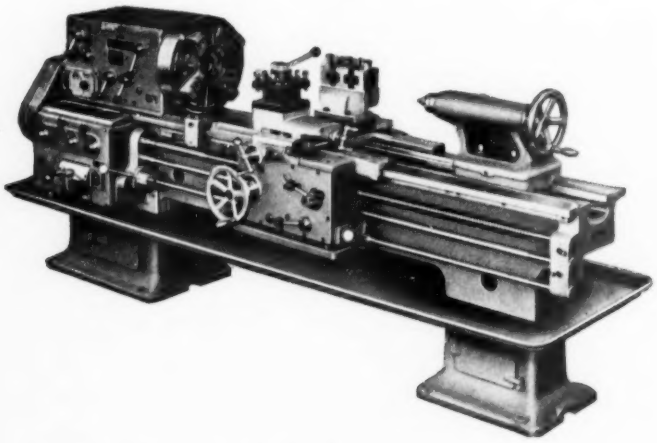
by use of the

HIGH EFFICIENCY HIGH SPEED LATHE

MODEL DLNE

7 advantages bound to increase your output:

1. Bed with diagonal ribbing, rigid structure, good chip flow.
2. Full protection against accidents thanks to safety devices. Face plate, chuck and dog plate equipped with slip safety device.
3. Largely dimensioned slide bearings of approved special bronze – Dimensions of front bearing 4" ⌀ × 6¼", of rear bearing 3⅛" ⌀ × 5⅛".
4. Hardened and precision ground gear wheels guarantee quiet running and excellent surface of turned work.
5. Norton gear box for 177 standard metric, Whitworth, modulus, and diametral pitch threads; coarse and multiple thread cutting attachments.
6. Patented apron with automatic release of longitudinal and transverse feed effected through micrometer stop guarantees a release accuracy of .0004". No recoiling of carriage when feed is released, therefore no tool breaks.
7. Carriage spindle adjustable backlash-free by means of spindle nut.



Representatives and Service:

USA: Guthery Machine Tool Corp., 130 West 42nd Street, New York 36, N. Y. Telephone CHickering 4-2820.

Canada: Transocean Machine Company Inc., 267 Dunbar Avenue, Montreal 16, P.Q. Telephone REgent 3-5373

WEISSER HEILBRONN

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HEILBRONN/NECKAR (Germany)

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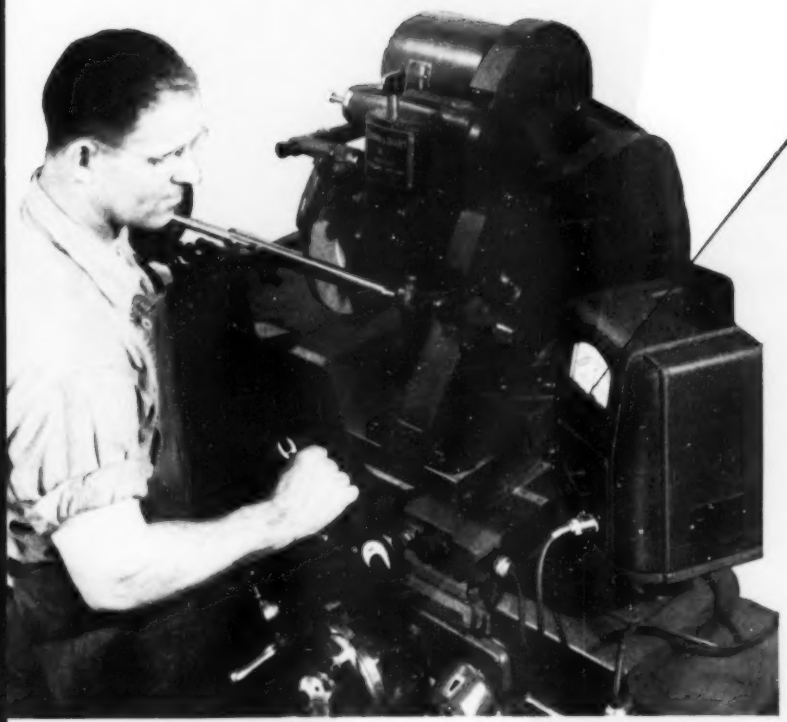
. . . an exclusive precision work-aligning short-cut for Brown & Sharpe Grinding Machines



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You Get
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MAGNIFIED 1800 TIMES...

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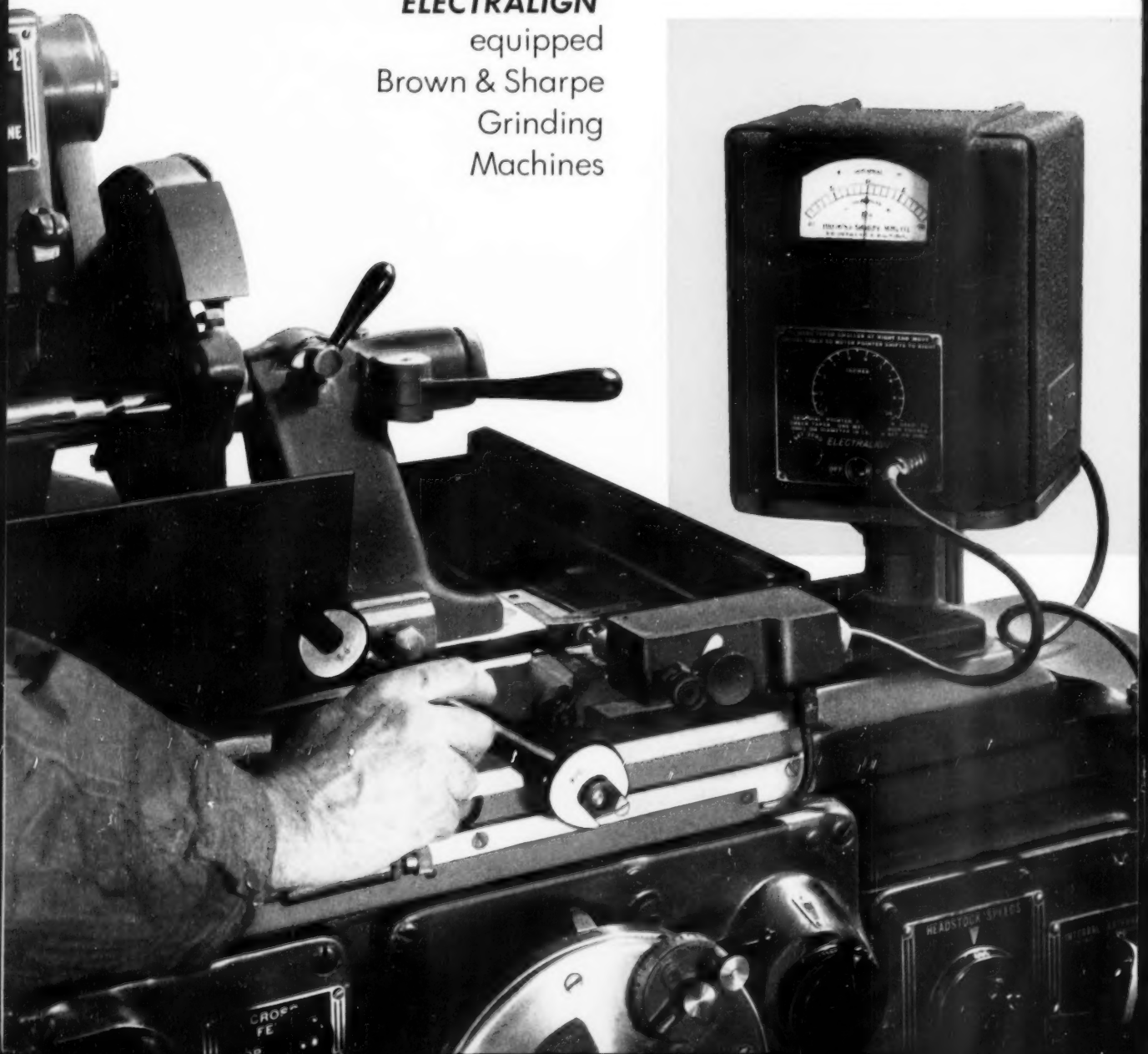
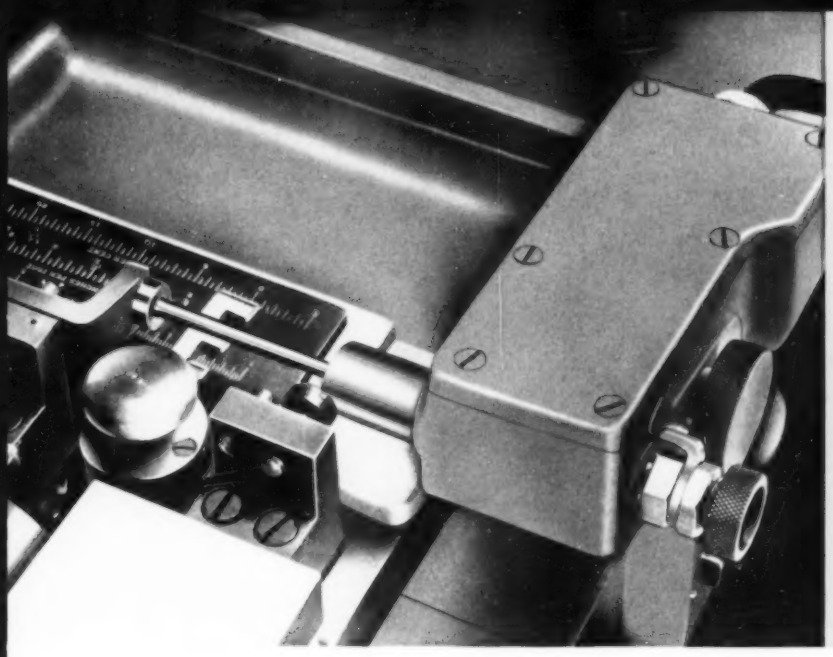




Setting gage permits simple adjustment for swivel table position. Highly-sensitive strain gages detect small displacements of the ends of the swivel table. An electronic amplifier magnifies movements to large scale . . . gives direct readings in .0001".

By electronically magnifying adjustments 1800 times, the unique ELECTRALIGN eliminates "cut and try" methods of aligning swivel tables on straight work or exact tapers. Your operators can immediately and easily establish correct swivel table alignment to within .0001", after only *one* preliminary grind. Moreover, ELECTRALIGN is always "on guard" . . . warns operator if a jar or vibration changes setting of swivel table. It simplifies and speeds your operator's task while doing much to eliminate work spoilage . . . particularly, where only .002" or .003" are left for finish grinding.

This exclusive Brown & Sharpe arrangement is so practical that alignment corrections may even be made during the grinding operation. Other time-saving advantages are illustrated on the following page. Write for complete details.

Brown & Sharpe

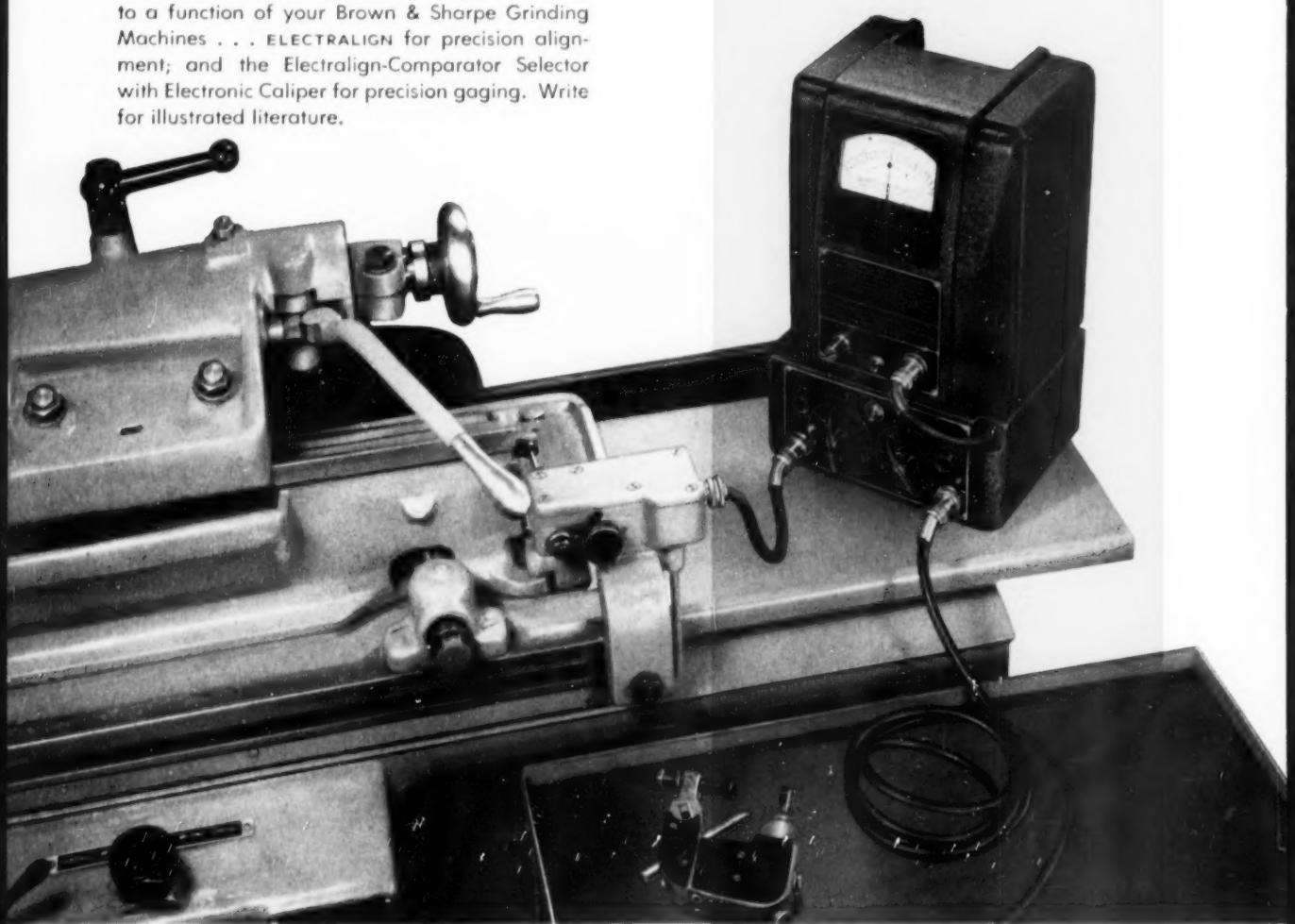
Reduces set-up and operating time . . . speeds production, and minimizes risk of work spoilage. ELECTRALIGN is available on all Brown & Sharpe Universal and Plain Grinding Machines and the No. 13 Universal and Tool Grinding Machine. Illustrated is the New No. 1 Universal.

ELECTRALIGN

permits combining precision work-alignment with precision gaging!

Through the exclusive Electralign - Comparator Selector, used in conjunction with ELECTRALIGN, you can make external or internal measurements in .0001" to .00001" . . . often without removing the work from the machine! This equipment eliminates differences in measurement due to human "touch or feel" and can be used with comparator gages of standard or special design. It is illustrated with the Brown & Sharpe Electronic Caliper No. 955.

Here at last is a way to transfer craftsmen's skill to a function of your Brown & Sharpe Grinding Machines . . . ELECTRALIGN for precision alignment; and the Electralign-Comparator Selector with Electronic Caliper for precision gaging. Write for illustrated literature.



Brown & Sharpe

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Machinists' Tools • Electronic Measuring Equipment • Johansson Gage Blocks • Permanent Magnet Chucks • Pumps

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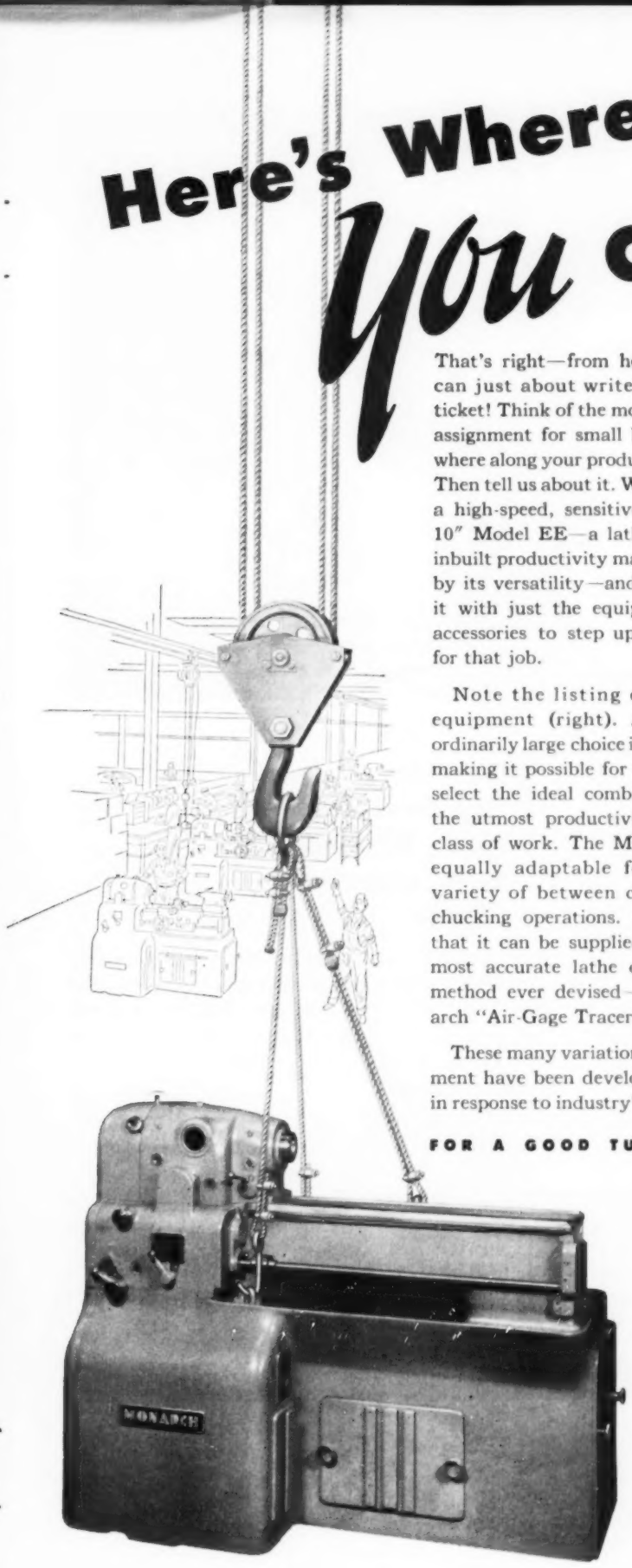
That's right—from here on you can just about write your own ticket! Think of the most exacting assignment for small lathes anywhere along your production lines. Then tell us about it. We'll deliver a high-speed, sensitive Monarch 10″ Model EE—a lathe with an inbuilt productivity matched only by its versatility—and you'll get it with just the equipment and accessories to step up standards for that job.

Note the listing of typical equipment (right). An extraordinarily large choice is available, making it possible for the user to select the ideal combination for the utmost productivity on *his* class of work. The Model EE is equally adaptable for a wide variety of between center and chucking operations. Note, too, that it can be supplied with the most accurate lathe duplicating method ever devised—the Monarch "Air-Gage Tracer."

These many variations in equipment have been developed solely in response to industry's demands that we make the basic Model EE design available for constantly widening uses. Could anything we say speak better for its design and specifications? Some place—*many* places, perhaps—this outstanding Monarch lathe can improve your production at lower cost. Send the coupon today for full details . . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



TYPICAL EQUIPMENT

- "Air-Gage Tracer"
- Steady rest
- Follow rest
- Taper turning attachment
- Collet attachments
- Air equipment
- Bar feed attachments
- Collet chucks
- Jaw chucks
- Step chucks
- Stops
- Micro-gaging diameter dial
- Hexagon power feed bed turret
- Hand operated cut-off slide
- Variable feed control
- Ball turning rest

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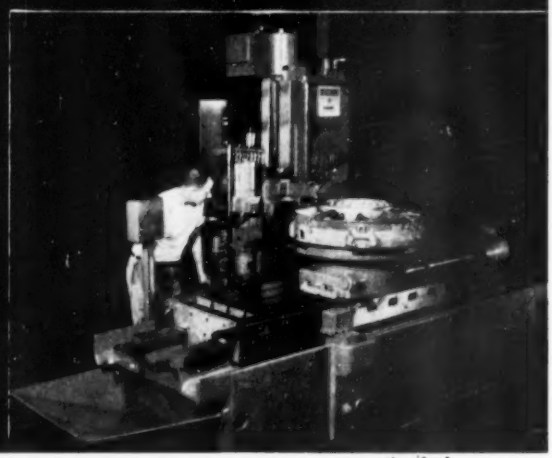
IF YOU WANT BETTER MILLING METHODS AND LOWER COSTS...

Use Sundstrand Machines and "Engineered Production" Service

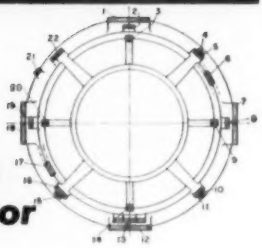


Profitable milling production can be obtained only by lowering unit production costs . . . obtaining the most economical solution to your milling problem and the most productive milling equipment in relation to your production requirements.

Basically, there are two approaches to solving these problems, (1) obtaining standard machines, then trying to process parts over these machines as economically as possible, (2) designing the most profitable processing method, then obtaining machines to suit this method — standard or semi-standard machines, if possible, or entirely special machines, if necessary. This latter method is Sundstrand "Engineered Production" . . . the most practical approach to economical milling. The following is a brief resume of the complete engineering and manufacturing service available from Sundstrand to meet all or any of your production milling requirements in small and medium size work.

These actual examples are presented to reveal one of each of the methods used in solving milling production problems. One of these methods may be the solution to your present problem.

1 Standard Rigidmil Mills 22 Pads On Compressor Frame



This machine is a standard Model 33 Rigidmil equipped with a power vertical feed attachment, an automatic index base controlled from push button station and an automatic quill positioning device. The quill positioning device can be pre-set for 19 automatic depth settings.

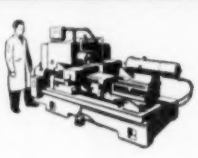
Four different types of cutters are used for the 22 cuts or surfaces machined. The part is located and clamped once but is indexed completely four times with a cutter change at the end of each complete index cycle. To operate the machine, the operator selects the quill position required by the pad presented to the cutter at each index, positions the head vertically by the head jog button and then starts the feed cycle. Table will feed in either direction as required.

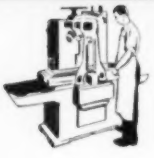
SUNDSTRAND

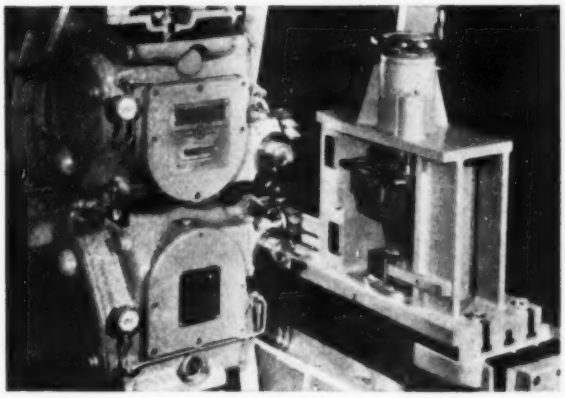
"Engineered Production" Service*

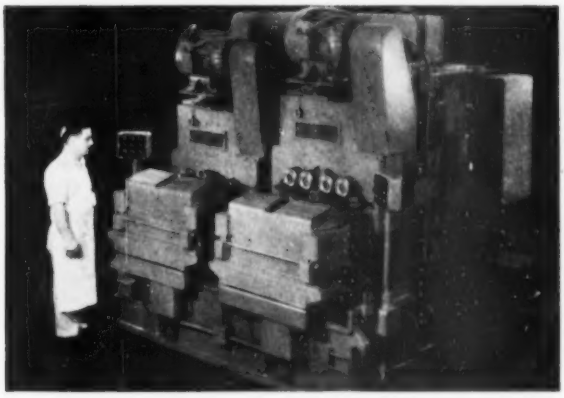
*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS

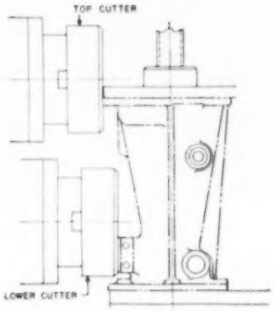




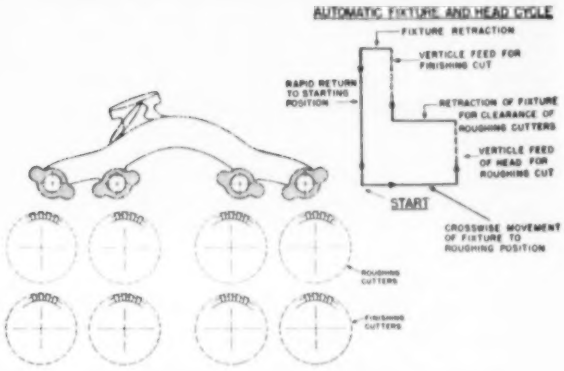




2 Milling 2 Pads at 60 Pieces Per Hour On Semi-Standard Rigidmil



This standard Sundstrand Rigidmil has been provided with two horizontal single spindle heads, one above the other. The two spindles are offset for milling a boss and one edge of flange of bearing retainers. A simple, manually operated work holding fixture holds one piece at a time, and an automatic table cycle of rapid approach, feed and rapid return is used to complete 60 pieces per hour. This is a good example of how a standard Rigidmil can readily be converted to handle special milling jobs.

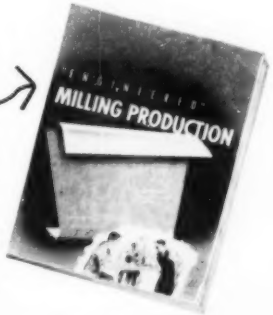

AUTOMATIC FIXTURE AND HEAD CYCLE
FIXTURE RETRACTION
VERTICLE FEED FOR FINISHING CUT
RAPID RETURN TO STARTING POSITION
RETRACTION OF FIXTURE FOR CLEARANCE OF ROUGHING CUTTERS
VERTICLE FEED OF HEAD FOR ROUGHING CUT
START
CROSSWISE MOVEMENT OF FIXTURE TO ROUGHING POSITION
ROUGHING CUTTERS
FINISHING CUTTERS

3 Milling 135 Manifold Per Hour On a Special Rigidmil

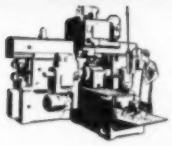
Here is a special two station Sundstrand Rigidmil that rough and finish mills four port contact faces of exhaust manifolds. Each station has eight spindles, the top four roughing and the bottom four finishing. The machine cycle and surfaces milled at one station is shown in the accompanying tooling diagram. In automatic cycle, controlled by the hydraulically operated work holding fixture, the head rapids up, feeds through the rough and finishing cut and rapid returns. Automatic cutter relief is provided by the fixture. Operator loads and unloads at one station while other station is in operation. Production is 135 manifolds per hour.

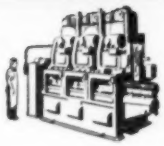
Free Data

You'll find plenty of milling methods in this book . . . methods that may provide a short cut or profitable solution to similar jobs in your shop now. Tooling diagrams and machine designs are both included. Write for your copy today. Ask for Bulletin No. 134.



TRIPLEX RIGIDMILS | SPECIAL MACHINES





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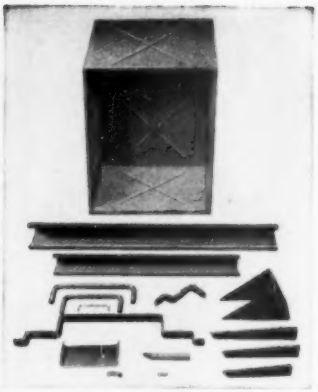
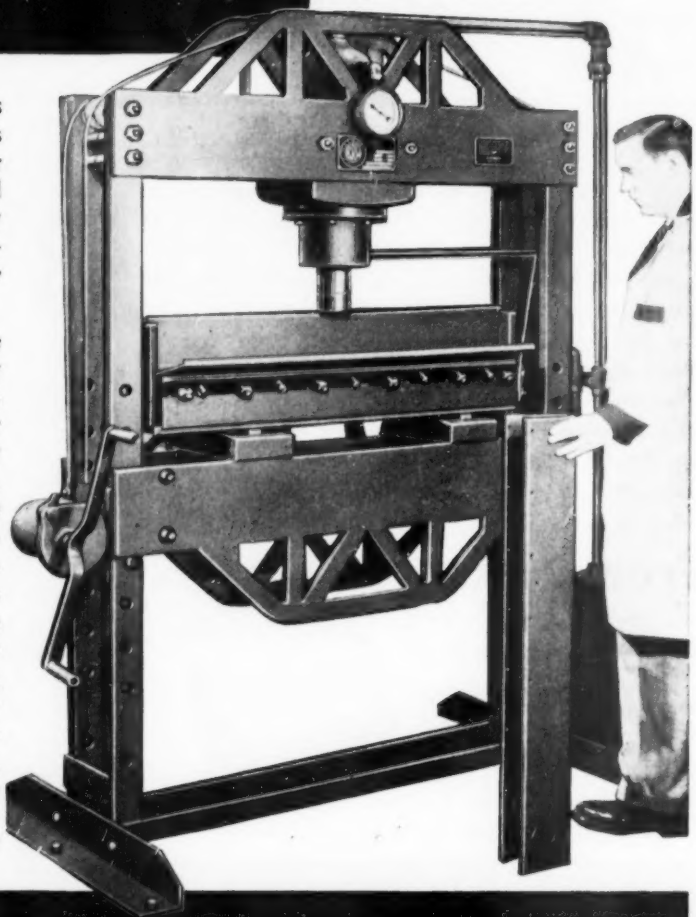


Here's the line-up . . .

Gross Machinery Inc. of Buffalo, N. Y., makers of dry cleaning equipment, forms all these parts on their KRW Hydraulic press. Each one used to be a slow, inaccurate hand or power brake job.

Gross Machinery originally bought this 75 ton KRW motor driven hydraulic press to form cylinder ribs of 14 gauge steel for their dry cleaning tumblers (second and third from top in photo above). Formerly made by hand, each rib required 12 minutes to form. Now the press does the *same job in 1½ minutes.*

But that was only the beginning. The press soon began poking its nose into every problem in the plant. It gave them a 50% increase in production of filter plates for their tumblers. The lint-collecting drawer (at top in photo above) used to rattle. Gross had almost decided to make these drawers out of heavier gauge, more expensive steel. But then they found that criss-cross ribs formed by their KRW press eliminated the trouble. Brackets for the tumblers, corner inserts for the tumbler hoods, clips for holding wire and tubing on the tumbler — all these jobs are now made faster, more accurately on this versatile KRW press. Earl Westphal, general production superintendent at Gross, says: *"We bought this press late in 1950 and it's paid for itself ten times over."*



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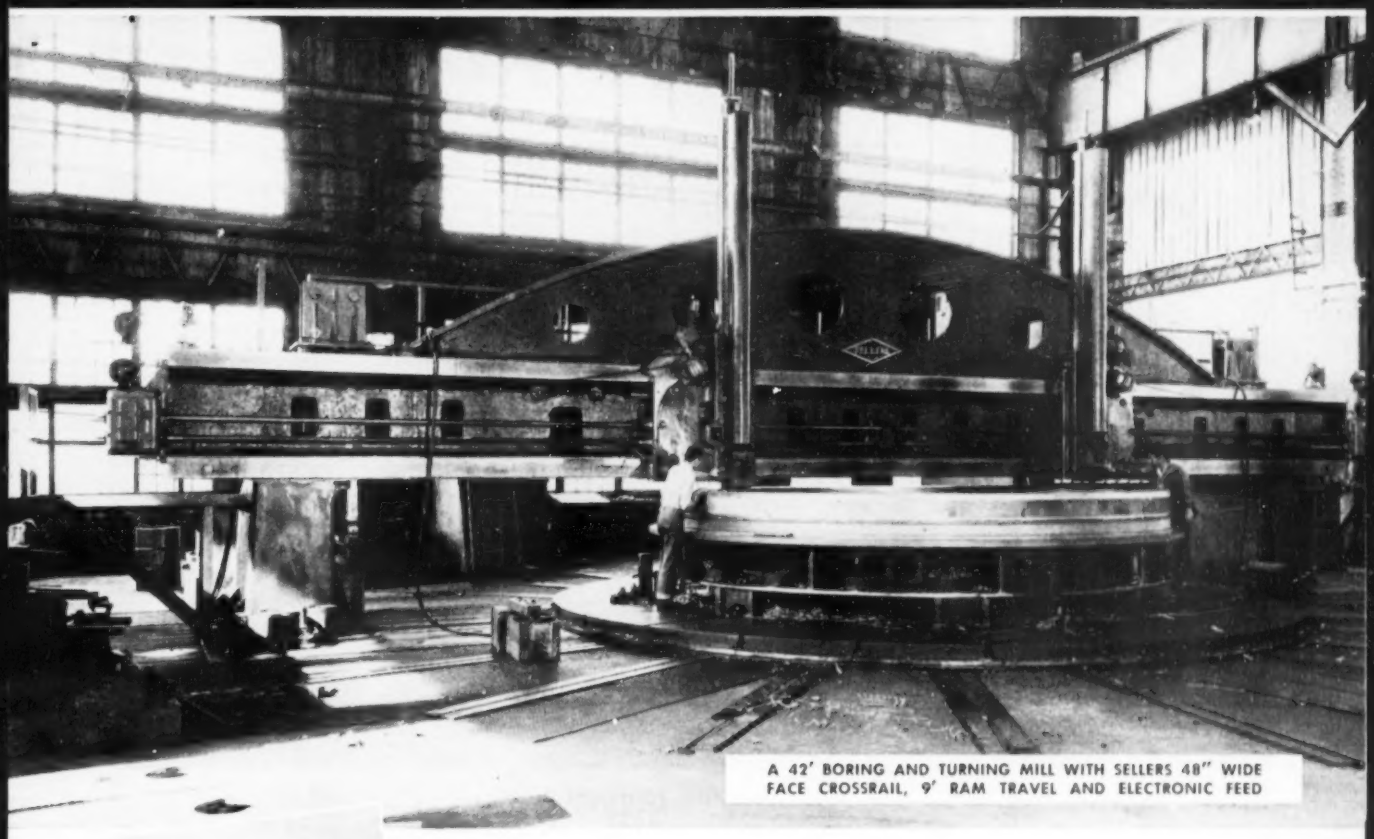
For your big jobs . . .

CONSOLIDATED HEAVY DUTY BORING AND TURNING MILLS



A 42' BORING AND TURNING MILL WITH SELLERS 48" WIDE FACE CROSSRAIL, 9' RAM TRAVEL AND ELECTRONIC FEED

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

With the Sellers Electronic Feed* to the crossrail heads, the feed can be varied in fine increments while the tool is cutting. This is of primary importance when using carbide tools as it insures getting maximum efficiency from both tools and machine. The unusual practicability of this advanced type of control is such that all feed and speed changes are controlled by portable push buttons always convenient at the point where the operator is working.

Consolidated Heavy Duty Vertical Boring and Turning Mills are of rugged uncomplicated design particularly adapted to heavy continuous operations requiring a high degree of accuracy combined with power. Among outstanding features that make them leaders in their field, is their type of table mounting which insures positive concentricity. Built in a range of sizes from 100" up to any requirement. Full information covering any size will be furnished upon request.

*Patents Pending

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1848

BETTS • BETTS-BRIDGEFORD • COLBURN • HILLES & JONES • MODERN • NEWTON • SELLERS

CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

ROCHESTER, NEW YORK

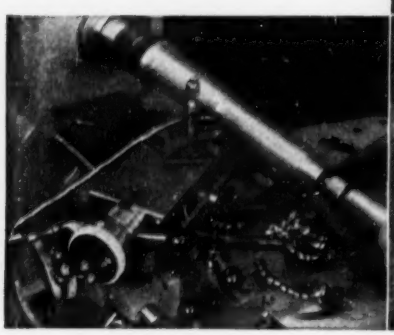
HARDINGE
ELMIRA, N.Y.

TOOL ROOM LATHE

Features QUICK *Feed Change*

Simply TURN KNOB FOR EXACT FEED REQUIRED

CHANGE FEEDS WITHOUT STOPPING SPINDLE OR CHANGING OR SHIFTING GEARS

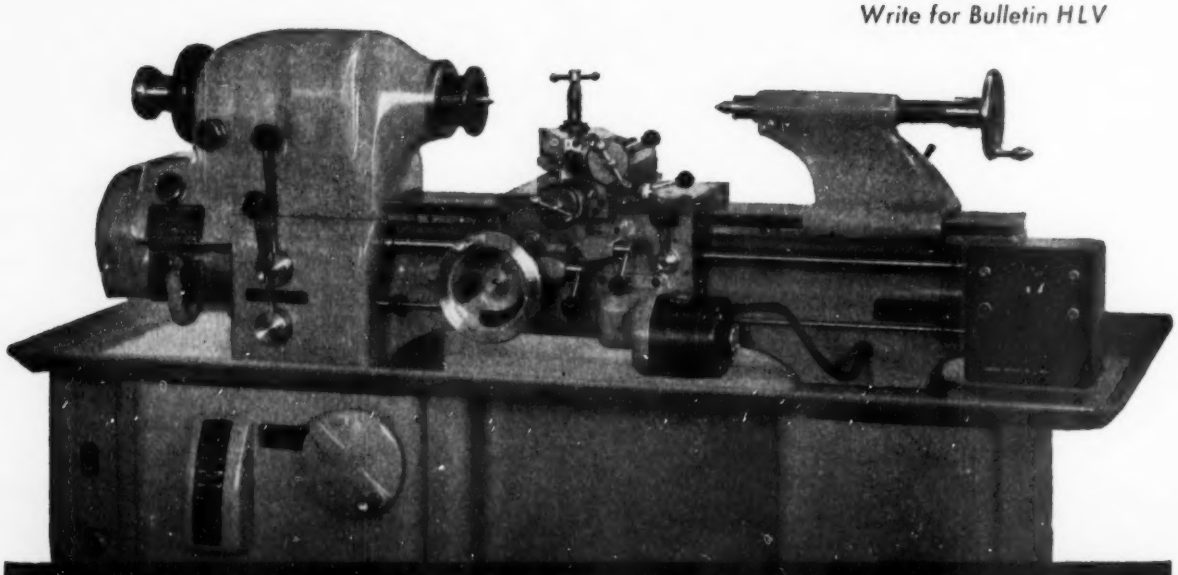


COARSE FEED

MEDIUM FEED

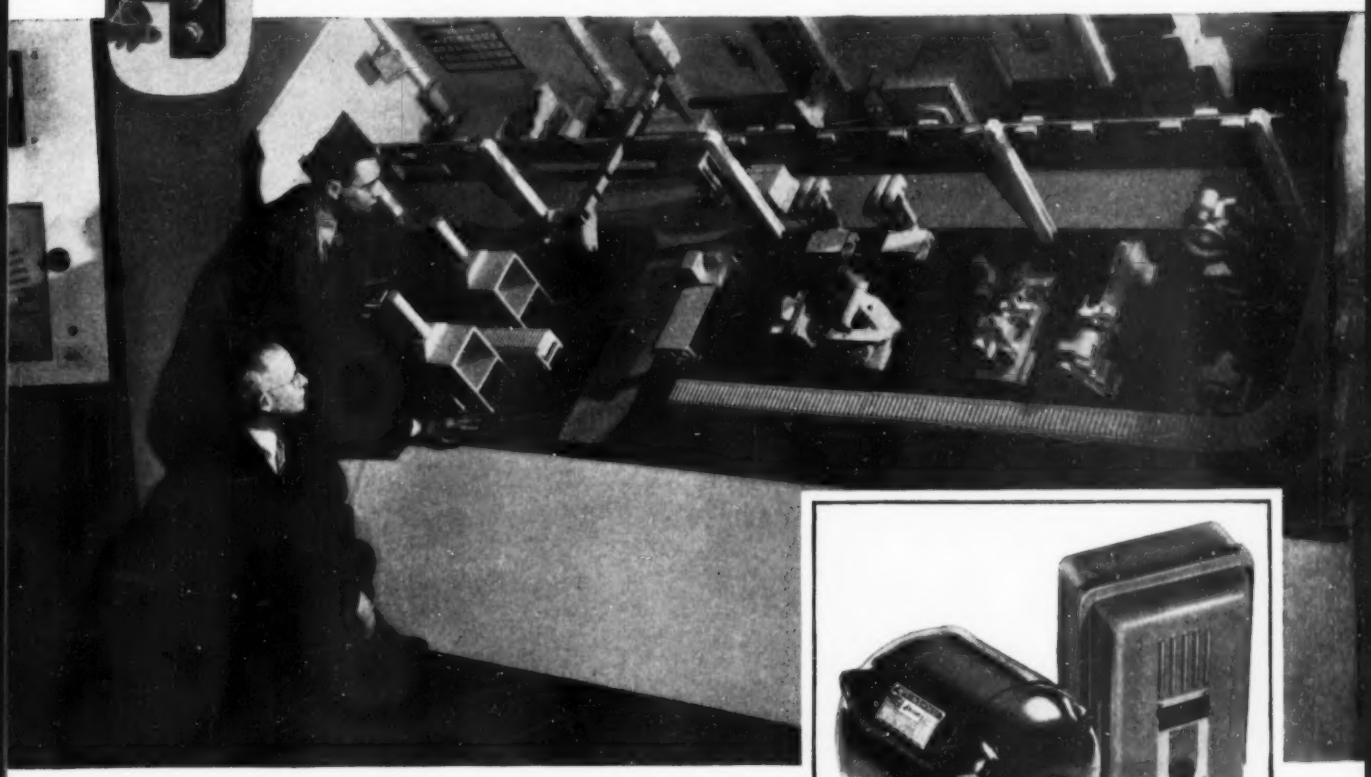
FINE FEED

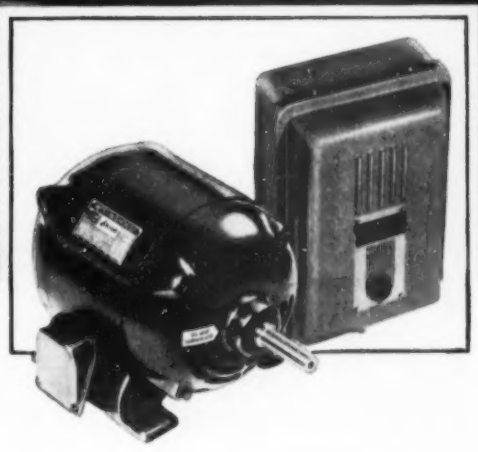
Write for Bulletin HLV



HARDINGE BROTHERS, INC., ELMIRA, N. Y.

AUTOMATION STARTS WITH WESTINGHOUSE MOTORS AND CONTROLS





How Westinghouse works with you to select motors and controls best suited for each job

Careful planning and proper application of motors and controls become even more important as more production processes become automatic. From 126 offices, Westinghouse offers you exactly this type of comprehensive planning and assistance in applying motors and controls.

Qualified Westinghouse engineers will gladly work with you in studying your motor and control problems. They'll offer suggestions and, if you like, recommend equipment best suited for your needs. These engineers are specialists in various fields. In every industry, the knowledge and experience of a Westinghouse engineer will prove valuable. This assistance is available on local as well as national and international levels, making possible close cooperation and full understanding of your particular needs.

Thirty-seven strategically located Manufacturing and Repair Plants bring you local factory service. Fully equipped and expertly manned, they quickly handle any motor or control servicing need. Then, too, there are the well-stocked Westinghouse Warehouses, so located as to assure speedy delivery of genuine renewal parts.

Literature available—Considering the applications of motors and controls? Ask your local Westinghouse representative to give you *101 Case Histories of Life-Line* Motors,* booklet B-4769-A. Ask, too, for the complete-line booklets on Westinghouse controls, B-6051 and B-5882; or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-21745

*Trade-Mark

YOU CAN BE SURE...IF IT'S Westinghouse

OSBORN

14 minutes by hand . . .
Now 3 minutes with push-button brushing

This strip act with Osborn wire brushes is taking off costly hours in the production of d-c motor armatures . . . typical of savings being discovered throughout industry with push-button brushing methods.

The job here is to remove enamel insulation from copper wires to assure top quality soldered connections. Formerly done by a tedious hand-scraping method, the time per armature was 14½ minutes. With the motor-driven brushing device shown the time has been cut to 3 minutes. As the armature is turned, a pair of Osborn Disc Center wire brush heads rotate downward on the wires and the insulation comes off clean.

This is typical of thousands of production jobs which have been simplified with the help of the **O**sborn **B**rushing **A**nalyst. For help to improve *your* cleaning, finishing or deburring operations, call your **OBA** or write *The Osborn Manufacturing Company, Dept. C-8, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

FREE: New booklet on deburring with Osborn Power Brushing. Write for your copy.

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES

☐ High Strength

☐ Fine Surface

☐ Toughness

☐ Hardenability

☐ Close Tolerance

☐ Accuracy of Section

WHAT ARE YOUR REQUIREMENTS?

Republic Cold Drawn Alloy Bars deliver all 6 . . . plus

UNIFORM MACHINABILITY

Check the properties your steel parts require . . . add the economy of uniform machinability . . . and you have the answer to production and cost problems . . . Republic Cold Drawn Alloy Steel Bars.

High-speed automatics take full advantage of the cost-cutting qualities of Republic Bars. Designers can make full use of the high strength and uniform structure of these cold drawn bars. Production men can get the ideal combination of wearability and strength out of the uniform hardenability and toughness of the alloy steel.

And . . . Republic 3-Dimension Metallurgical Service focuses the experience of our Field, Mill, and Laboratory metallurgists on your production problems for the best answer with Republic Cold Drawn Alloy Steel Bars.

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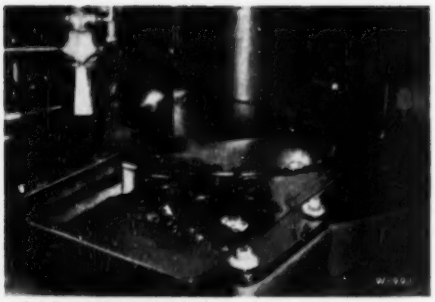
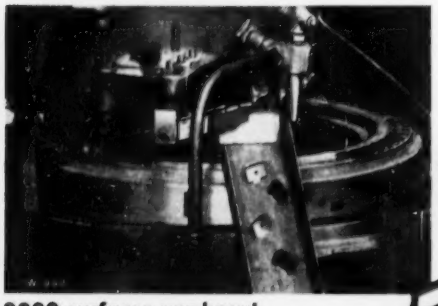
Republic COLD DRAWN
REPUBLIC STEEL
ALLOY STEEL BARS

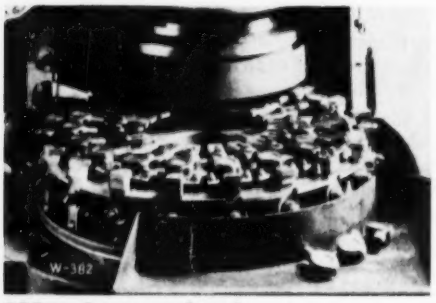


4360 surfaces per hour!



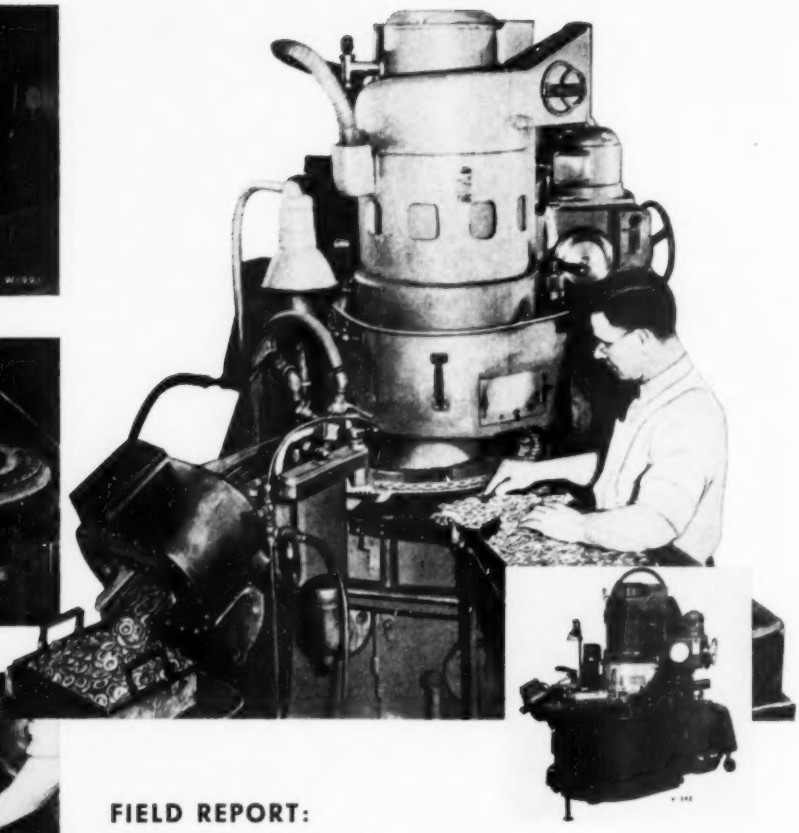
2000 surfaces per hour!

940 surfaces per hour!



900 surfaces per hour!

1400 surfaces per hour!



FIELD REPORT:

... a Blanchard No. 16-A Surface Grinder saved them $39,000 in 2½ years! (cost approx. $12,500) Their order follows for a Blanchard No. 16-A2!

Here's proof of performance and proof of satisfaction, yet typical of what users expect *and get* from the Blanchard 16-A Surface Grinder. Several typical examples of production rates are shown here. Above, for instance, .003" of stock is being removed from one side of small gears to a tolerance of ±.001" *at a rate of 2100 per hour!* This machine has a 30" chuck and a Blanchard Demagnetizer.

The No. 16-A grinds continuously with a wheel that is set and automatically maintained at a fixed height above chuck face, and finishes one surface of the work to size in one pass under wheel. Operator has only to load the work on the magnetic chuck or in an automatic clamping fixture. A wheel control automatically feeds the head down to compensate for wheel wear. Unloading is usually automatic. Attachments can be supplied for demagnetizing and washing the work as it leaves the grinder. On most work, limits of ±.0005" are readily maintained.

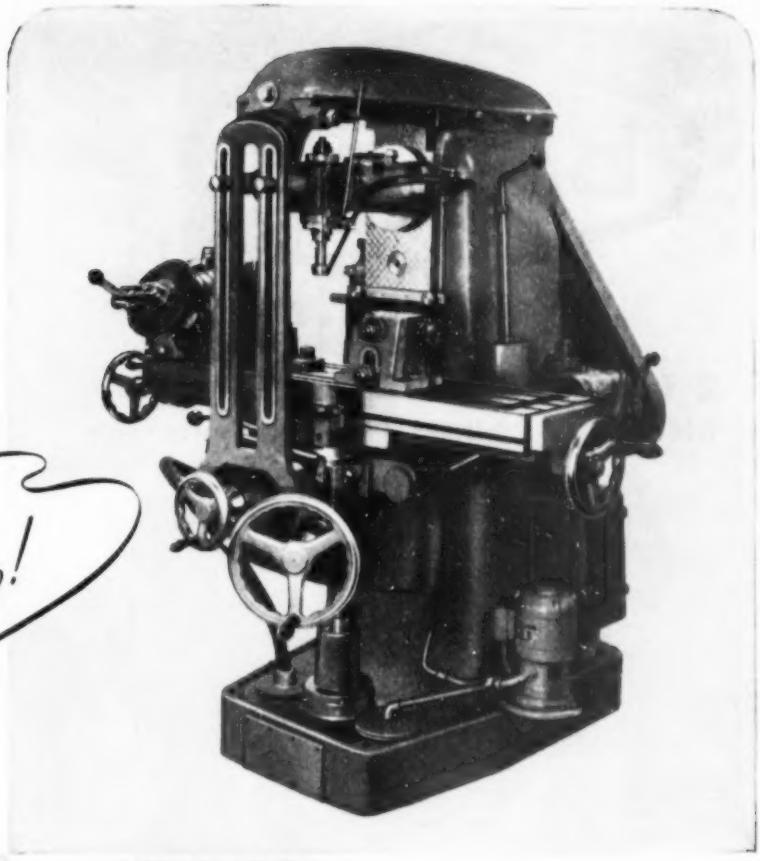
The No. 16-A2 (not shown) has two wheels, each with automatic size control. It roughs and finishes one surface of the work in one pass through the machine.

Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

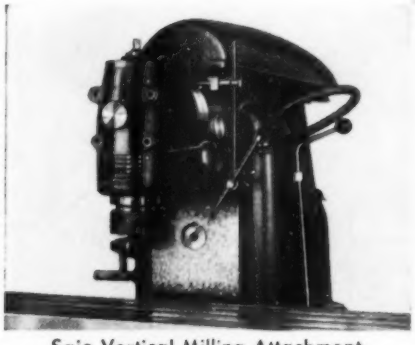
PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE CO.

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.



Swedish Craftsmanship!



Sajo Vertical Milling Attachment

The Sajo "Plain" Milling Machine

the SAJO "UNIVERSAL" MILLING MACHINE

exemplifies the expert workmanship that is traditional in Swedish machine tools. Like all SAJO Millers, this new Universal Milling Machine was designed and built to the highest standards of quality and practical utility.

Avoidance of exterior "luxury" features, slight in value but substantial in cost, and concentration on the vital factors of construction, enable the SAJO to deliver top performance at moderate cost.

SAJO Millers are available in Plain and Universal types, with longitudinal power table feed only, or with power feed in all directions. Screws and dials are in the U. S. inch system.

★ **Standard Equipment includes:**
3 HP motor and starter equipment, motor driven coolant system, adjustable table feed nut to allow climb-milling, 1" arbor, arbor support brace.

★ **Extra Equipment:**
Universal Dividing Head, Vertical Milling Attachment, Slotting Attachment, Swivel Base Vise, Rotary Table.

CONDENSED SPECIFICATIONS

Table Size	41½" x 9¼"
Longitudinal travel: Plain Miller	24½"
Universal Miller	27½"
Transverse travel	8¼"
Vertical travel	19"
12 spindle speeds	36-1540 RPM
Table feeds	12
Taper in spindle	No. 40 NMT
Main motor	3 HP

Precision anti-friction bearings on spindle and gear shafts
One-piece column and base
Net weight – 2200 lbs.

Write for Catalog

NO PRIORITY—— PROMPT DELIVERY——ATTRACTIVE PRICE

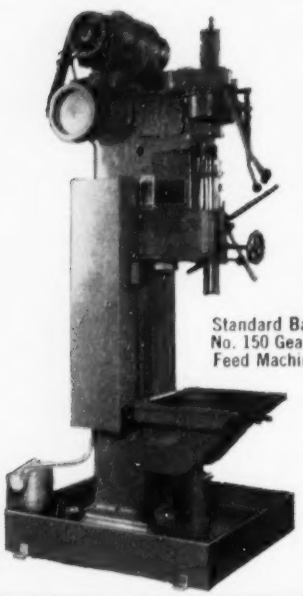
AUSTIN INDUSTRIAL CORP. 76-F MAMARONECK AVE. WHITE PLAINS, N. Y.
DEALERS IN PRINCIPAL CITIES

BAKER

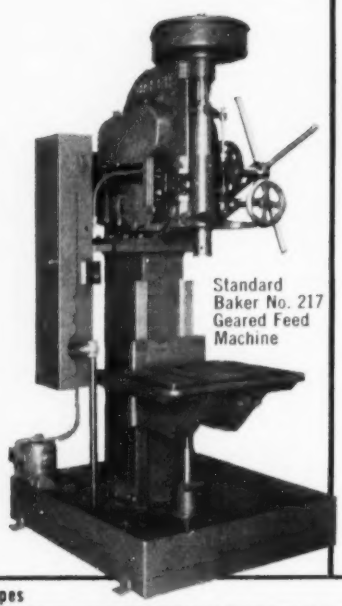
Standard HEAVY-DUTY DRILLS

2 to 4 WEEKS DELIVERY . . .

ON THESE MACHINES—Subject to prior sale



Standard Baker No. 150 Geared Feed Machine



Standard Baker No. 217 Geared Feed Machine

Standard Baker No. 422 Geared Feed Machine

Standard Baker No. 321 Geared Feed Machine

MAJOR SPECIFICATIONS—Single Purpose Types					
	150	150 Q.C.†	217	321	422
1. Capacity—Max. Dia. Drill in S.A.E. 1035 Steel	1½	1½"	2	3	4½
2. Max. H. P. Motor used	7½	7½"	10	15	20
3. Distance center of Spindle to Frame (Gap)*	11"	11"	12¼"	12¼"	12¼"
4. Maximum Spindle Travel	11"	11"	12"	16"	16"
5. Spindle—Outside Dia. splined driving end	1¾"	1¾"	2"	2-13/16"	3¼"
6. Dia. of Spindle Sleeve	2¾"	2.750"	3¼"	4¼"	5¼"
7. Dia. of Spindle Nose	2.975	2.975"	.3225	4.225"	5.225
8. Morse Taper in Spindle as standard	No. 4	No. 4	No. 5	No. 5	No. 6
9. Standard Speed Range in R.P.M.	151-632	48-1120	76-614	27-220	20-165

* Can be increased 3" by use of offset Spacer Block. † Quick Change, 12 Speeds

Baker single purpose type drills are heavy duty . . . provide a wide range of speeds and feeds for Single and Multiple Spindle Drilling . . . Reaming . . . Boring . . . Facing . . . Chamfering . . . Undercutting and Tapping Operations. Write for full details.

Baker Brothers, Inc.
Toledo, Ohio

Gentlemen:

Please send more information on Baker Standard Drills to:

NAME.....

COMPANY.....

STREET.....

CITY.....STATE.....

BAKER BROTHERS, INC. Toledo, Ohio

DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES

ARMSTRONG

Use the Correct...

ARMSTRONG TOOL HOLDERS

to increase pieces, production and profits!

Because they do their work so well, without repairs, maintenance or replacement . . . because they last for years and have become as much a part of everyday operations as steel itself, the importance of using the correct type and size ARMSTRONG TOOL HOLDER for each operation, is frequently overlooked. It should always be remembered that by controlling the cutting point, ARMSTRONG TOOLS control both the productivity and efficiency of every lathe, planer, slotter, and shaper in most shops.

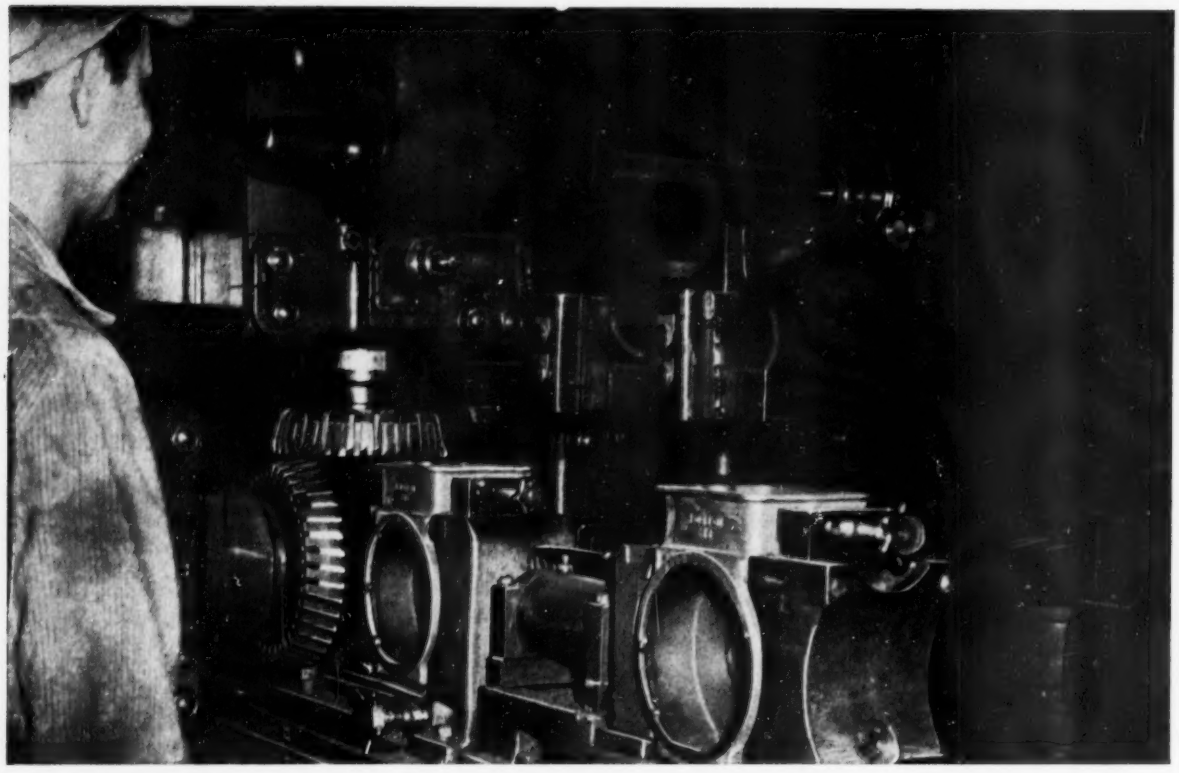
Tools so vitally situated, no matter how trouble-free, deserve periodic checking . . . checking to see that the correct size and correct type ARMSTRONG TOOL HOLDER is being used for each operation: checking to be sure that you are taking full advantage of the newer additions to the Armstrong System—the special types for ARMIDE (Carbide Tipped) Cutters, others for ARMALOY (Cast Alloy) Bits and Blades; the newer "spring" form threading tools and cutting-off, etc., etc.

Write for a recent ARMSTRONG Catalog and check your tooling of each operation.

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

5215 W. ARMSTRONG AVENUE **CHICAGO 30, ILL.**



450 pieces per grind...
Despite Vibration

HAYNES STELLITE alloy milling cutter blades are being used successfully to machine gas-meter bodies, despite considerable vibration. The meter bodies have thin walls with respect to their other dimensions, and even though they are held in a rigid fixture, vibration cannot be completely eliminated. HAYNES STELLITE alloy tools have the toughness to withstand the chatter and also the red hardness to do the job fast.

Three milling heads, each containing 36 standard HAYNES STELLITE blades, face the flange at the top of the meter and straddle mill the two sides simultaneously. The tools previously used produced as few as 14 pieces per grind. HAYNES STELLITE tools produce an average of 450 pieces.

For information on how to use HAYNES STELLITE tools on your machining jobs, write for the new manual, "HAYNES STELLITE Metal-Cutting Tools."

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
UCC
General Offices and Works, Kokomo, Indiana
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Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

"Haynes" and "Haynes Stellite" are trade-marks of Union Carbide and Carbon Corporation.

Use SIZE CONTROL *REVERSIBLE* PLUG GAGES

FOR FAST, ACCURATE GAGING AT LOWEST COST...

...our catalog 53 tells you how!

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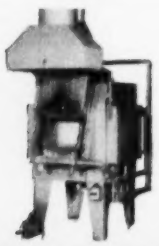
Division of AMERICAN GAGE and MACHINE COMPANY

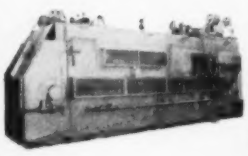
SIMPSON ELECTRIC COMPANY SIZE CONTROL COMPANY WALSH PRESS & DIE COMPANY

Conveyor brazing furnace

Batch tempering furnace



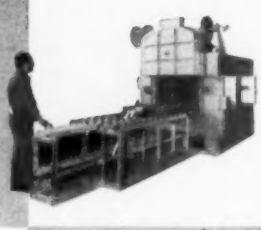
Controlled atmosphere hardening furnace (tool room)

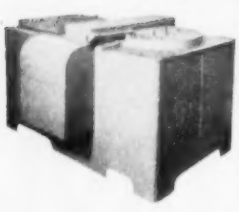


Controlled atmosphere conveyor furnace (production)

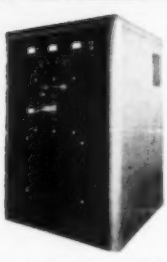
a complete line of heating and melting FURNACES

Production annealing and stress relieving furnace



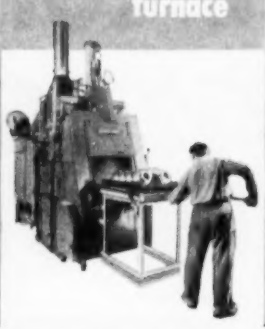


Lindberg-Fisher 2-chamber induction melting and holding furnace

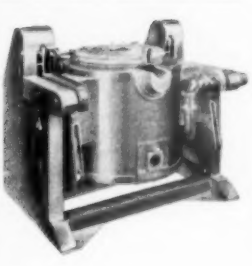


High frequency induction heating unit

Carbonitriding furnace

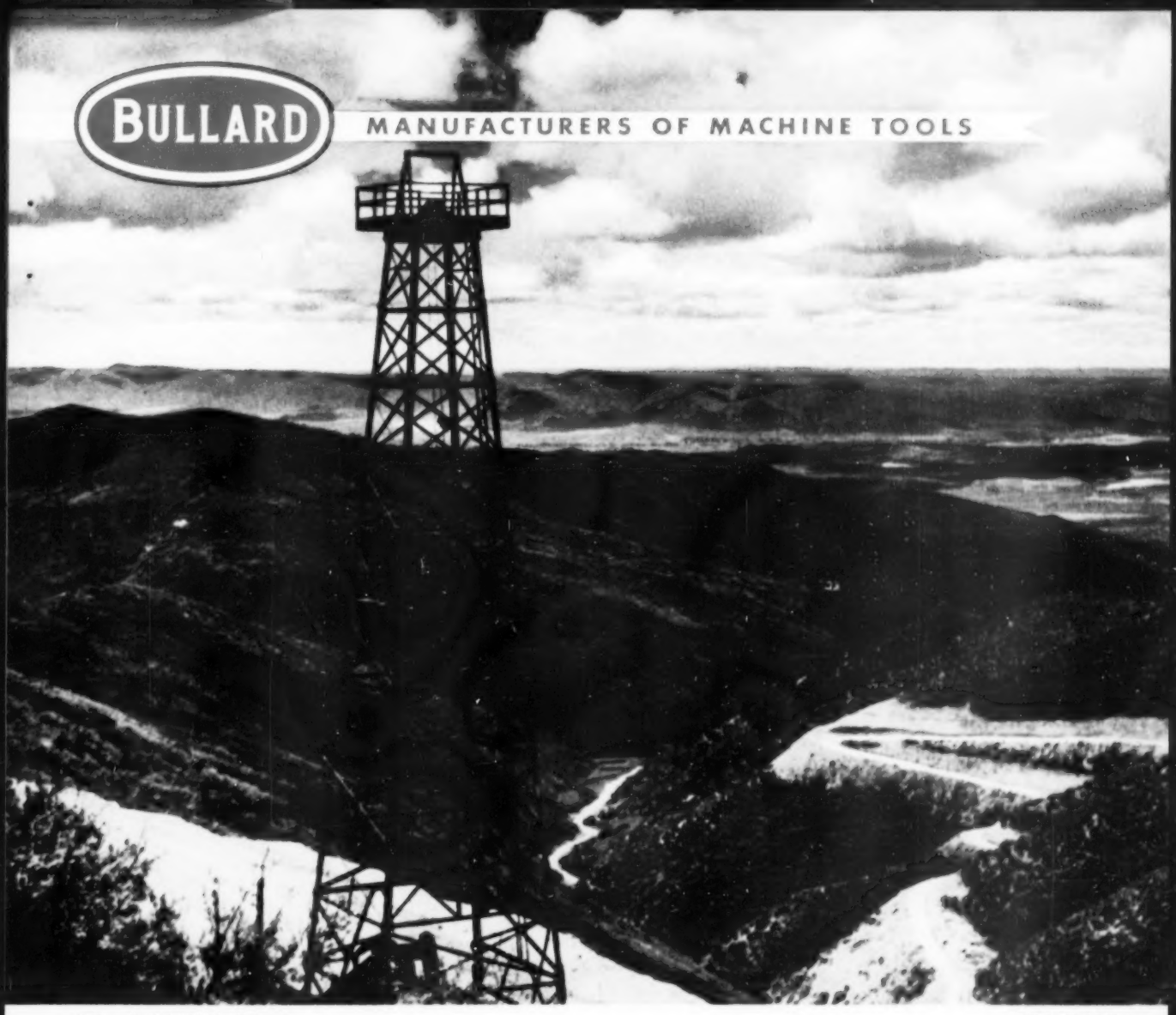


Fisher melting and holding furnace (gas or oil fired)



Lindberg Engineering Company manufactures a complete line of industrial heat treating furnaces, industrial melting furnaces, laboratory equipment, and high frequency induction heating equipment. Lindberg Engineering Company, 2445 West Hubbard Street, Chicago 12, Illinois. Write for details.

LINDBERG FURNACES



Wilson Creek Oil Fields, Colorado

Wide World Photo

The Invisible Background of Industrial Progress

Literally "Black Gold from the Clouds" — the Wilson Creek Oil Fields of Colorado, situated 8,378 feet above sea level on the Continental Divide, the highest oil field in the U.S.A.

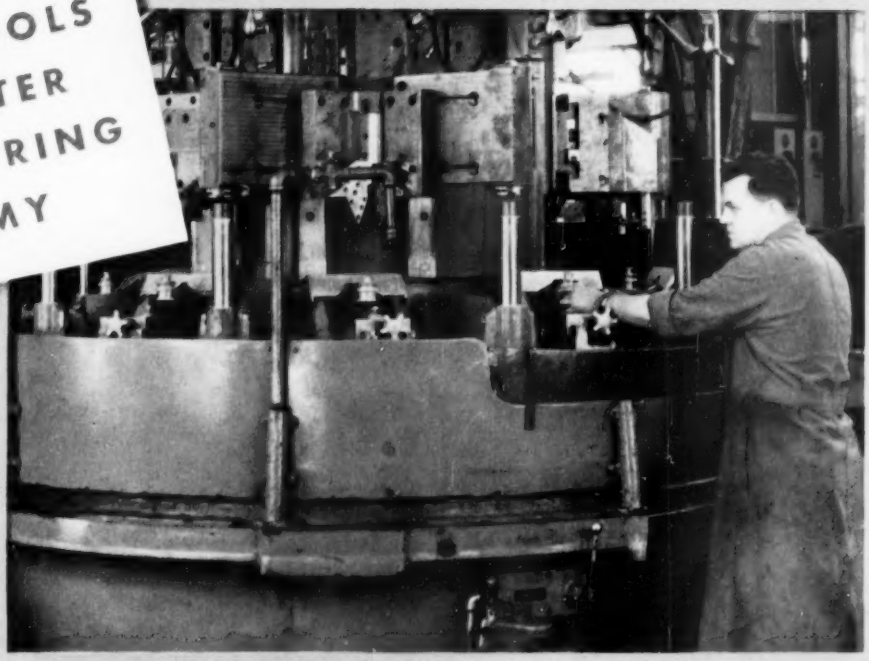
Manufacturing and maintaining equipment for the drilling and the transportation of oil from the well to the refinery represents a portion of "The Invisible Background of Industrial Progress."

★ The Bullard Company, designers and builders of *Modern Machine Tools*, have consistently pioneered and engineered machines for manufacturing parts and equipment for oil producers and allied industries the world over.

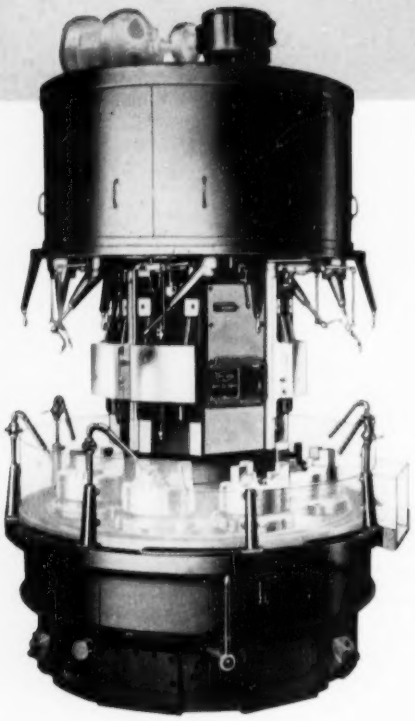
★ *For greater manufacturing economy REFER to next page.*

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY



With a Mult-Au-Matic you have the assurance of consistent and repetitive accuracy to close tolerances on each piece whether the run be large or small.



More than ever before, larger volume of production demands the most efficient methods for machining of identical and interchangeable pieces. The Bullard Mult-Au-Matic way is a proven method.

More than ever before, Bullard Machine Tools meet the requirements of modern industry.

You too can be far ahead — years ahead — in 1953.
Why not find out — get all the facts — let Bullard engineers analyze and assist in your manufacturing problems.

BULLARD

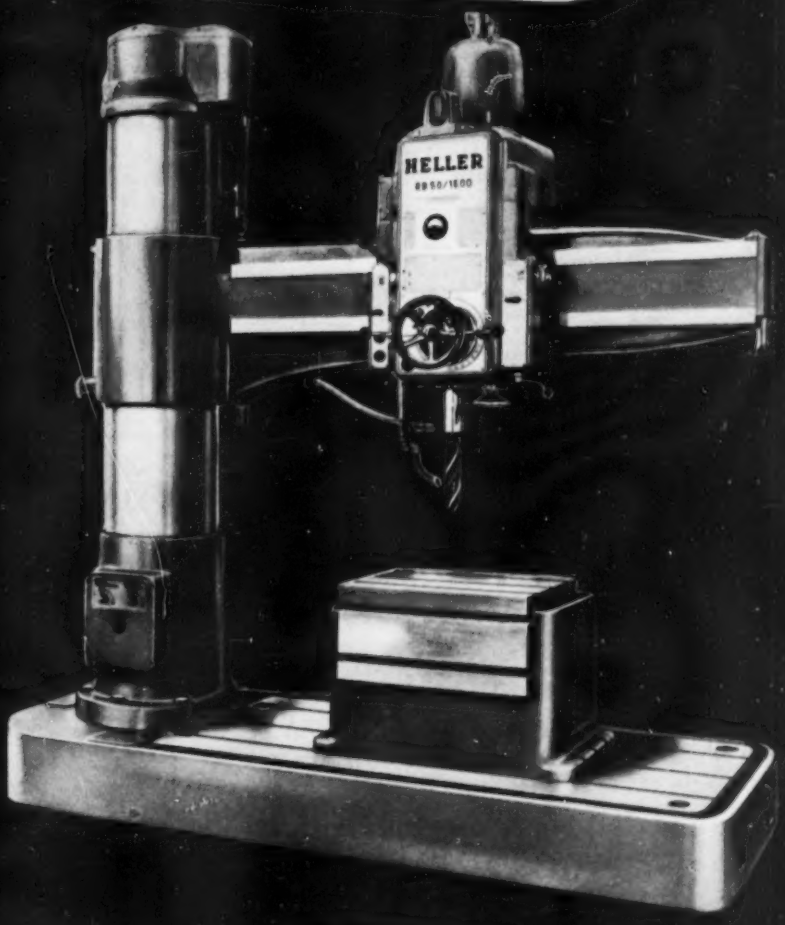
Time saved is money earned. Write now for information on Bullard Mult-Au-Matic.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT

Cut Costs and
Increase Efficiency with

HELLER

RADIAL DRILLING MACHINES



HELLER MACHINE CO.
114 Liberty St., New York 6, N. Y.

KNEE & PLANER TYPE MILLING MACHINES
COLD SAWING MACHINES • SAW SHARPENING MACHINES • SAW BLADES • TRANSFER MACHINES • SPECIAL MACHINES

Heller Radial Drilling machines are offered in 2½ foot, 4 foot and 5 foot arm types. Column is 16" in diameter and drive is by direct motor through multi-disc friction clutch. Gear change is simplified through pre-selector unit with automatic depth drilling and tapping switch. Arm raising and lowering and saddle adjustment is hydraulically locked as desired. Construction is complete with anti-friction bearings with special oil pump for saddle lubrication. In addition to Radial drills, we offer also Column Drilling Machines and Gang type drilling machines

Importing Heller Machines Since 1926

NIAGARA Presents

outstanding design features:

Double End Twin Drive with double reduction gearing (for straight bends and smooth power application.)

A rigid One-piece Frame with permanently welded crown for minimum deflection and permanent alignment.

Laminated Non-Metallic Ways maintain accurate alignment and assure longest life of dependable service.

Deep Twin Plate Steel Bed with open slug clearance for multiple punching work.

Powerful Air Cooled Friction Clutch and Brake assures easy ideal "Press Brake Action".

Air Electric Clutch Control may be operated by palm buttons on ram or foot switch with provisions for "Inching", "Single Stroking" and "Continuous Run".

Reversible Flywheel can be pulled out of accidental stalls.

Power Adjusted Ram with self-locking adjusting screws.

Micrometer Dials accurately indicate position of ram so die settings can be quickly repeated.

Accessibility at rear with plenty of clear working space for safety.

Gages with full horizontal and vertical adjustment for front or rear of press.

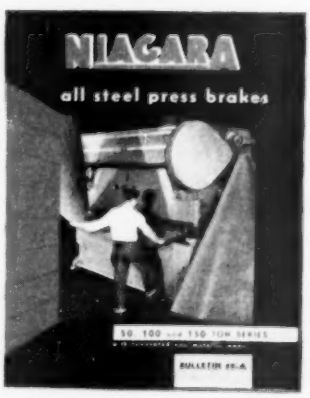
Angle Support Brackets and Bolster Plates quickly convert press for stamping operations without affecting bending ability.

All gears operate in totally enclosed sealed baths of oil.

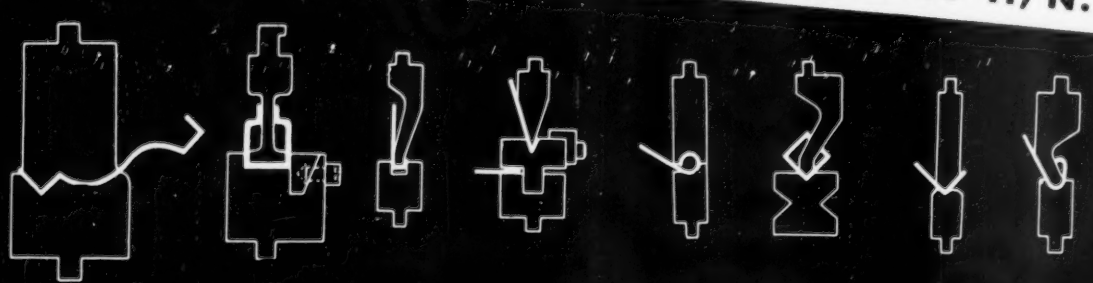
versatility of operations

BENDING	JOGGLING
FORMING	NOTCHING
DRAWING	PUNCHING
BEADING	PIERCING
CURLING	PERFORATING
CORRUGATING	SLITTING
BLANKING	TRIMMING
EMBOSSING	ETC.

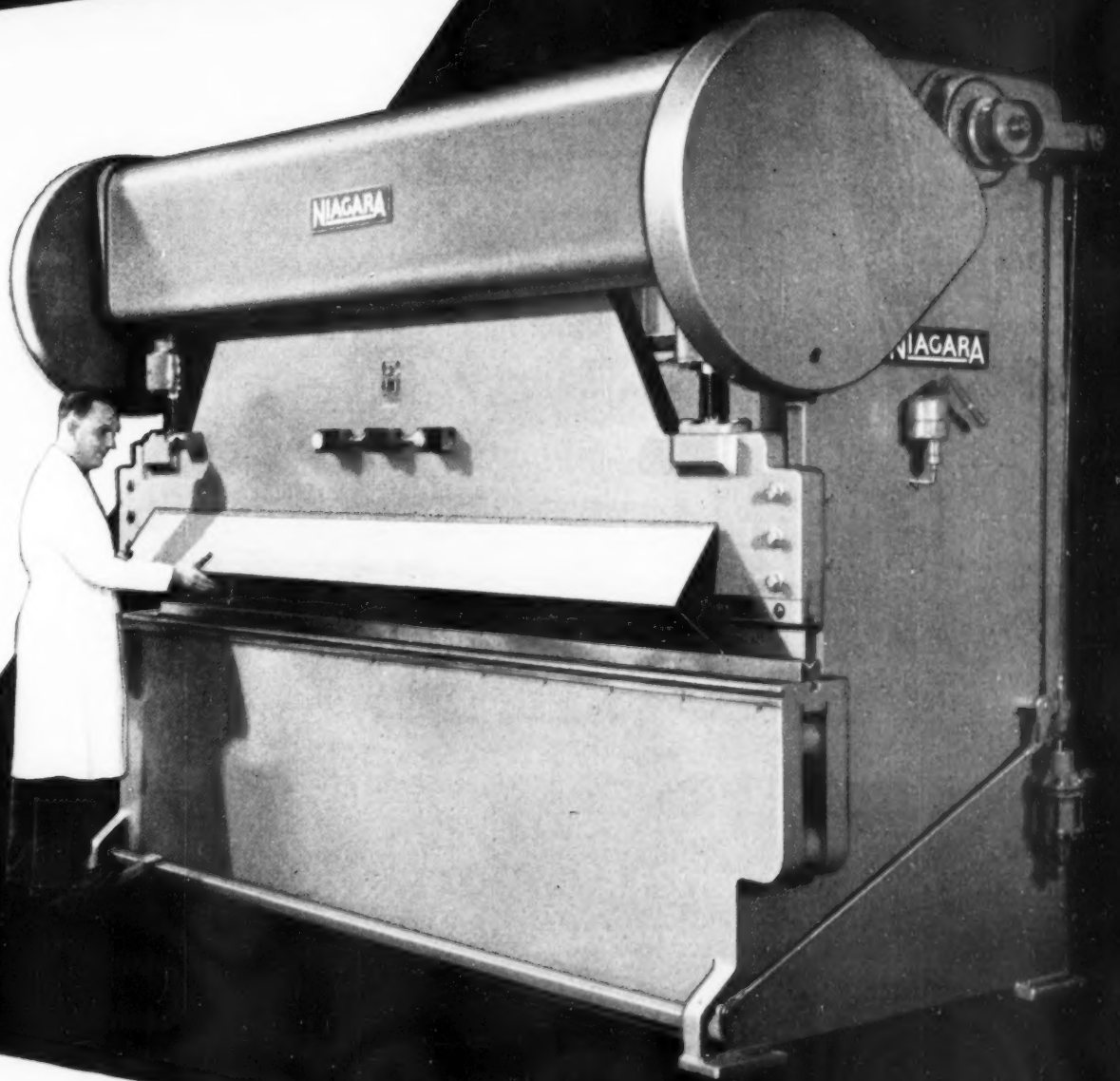
WRITE FOR BULLETIN 89



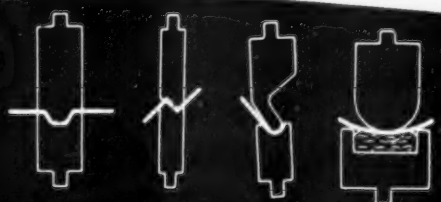
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.



The Last Word in New All-Steel PRESS BRAKES



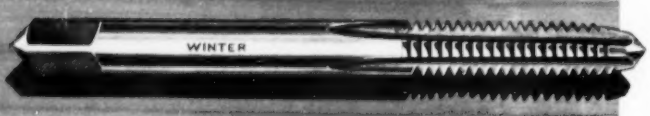
DISTRICT OFFICES: DETROIT, CLEVELAND, NEW YORK, PHILADELPHIA



America's Most Complete Line of Presses, Shears, Machines and Tools for Sheet Metal Work

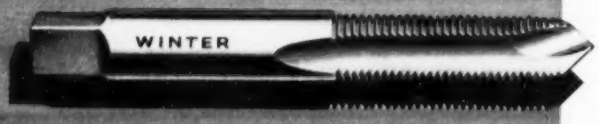
Dealers in principal U. S. cities and major foreign countries

Uniform Flute Contours

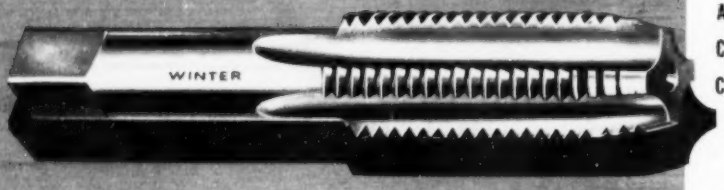


Exact Flute Spacing

120°
120°
120°



Precision Chip Driver Contours



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Concentric
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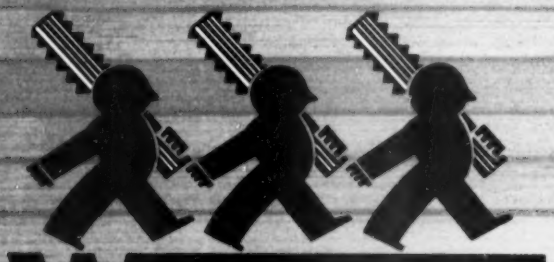
FOR CLOSE-LIMIT HOLES,

You Need These Precisely-Accurate WINTER TAPS with

BALANCED Action

ALWAYS AT YOUR SERVICE
Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.



WINTER

WINTER BROTHERS COMPANY
Rochester, Michigan, U. S. A. Distributors in principal cities. Branches in New York, Detroit, Chicago, Dallas, San Francisco.
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Drilling Holes In A Hurry–
NATIONAL TWIST DRILLS
Give You the Edge!
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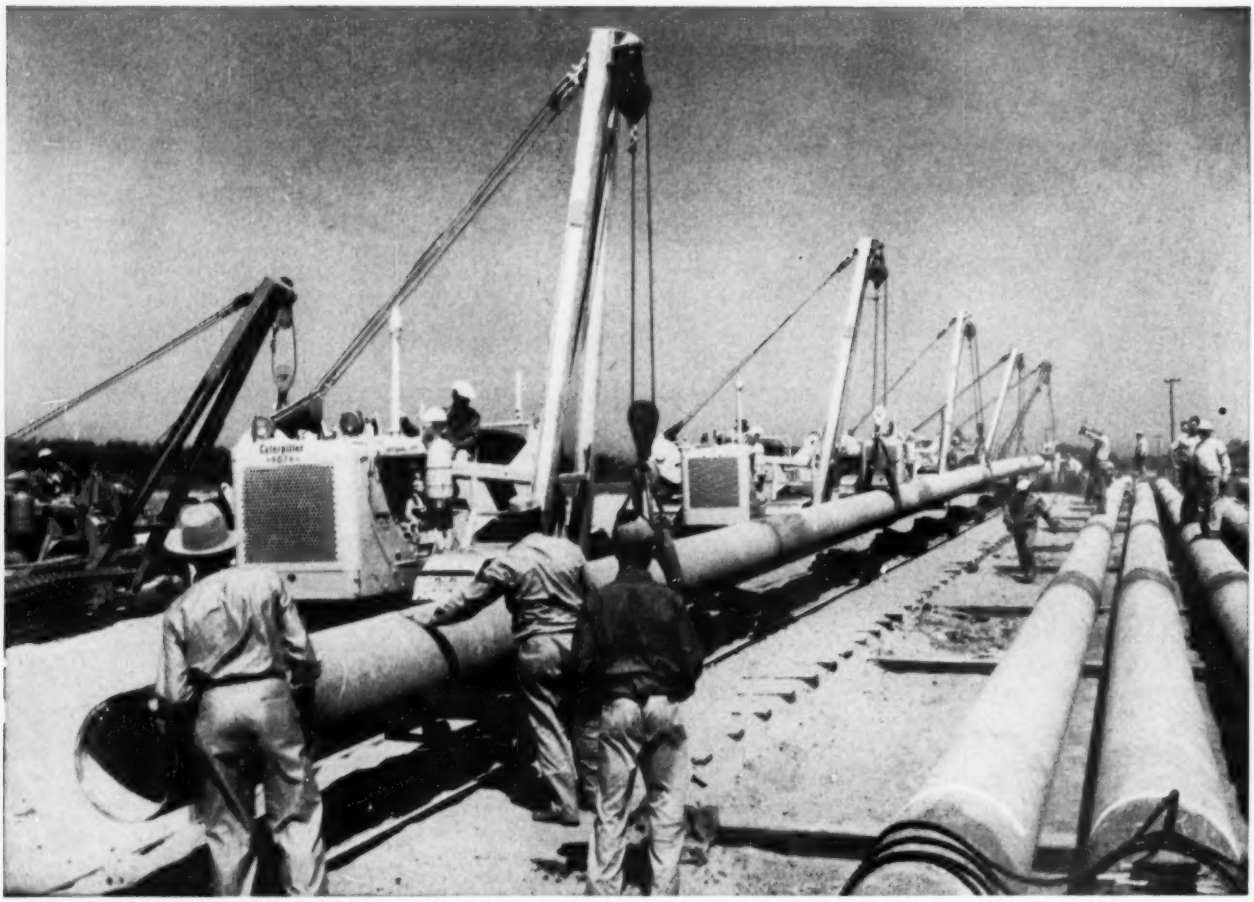
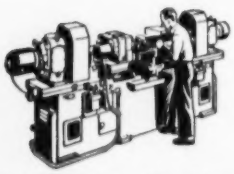
LINK-BELT ball and

...keep company with



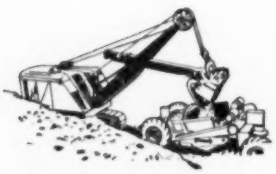
Caterpillar Pipe Layers mounted on Caterpillar track-type Tractors lay submarine oil pipe line which will load and unload tankers. Link-Belt Series DE self-aligning roller bearings are used in the winch of these machines for easy and accurate winch control necessary to the handling of long welded pipe sections.

LINK-BELT ball and roller bearings

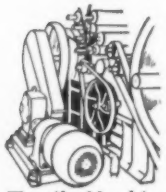


Metal Working Machinery

Farm Machinery



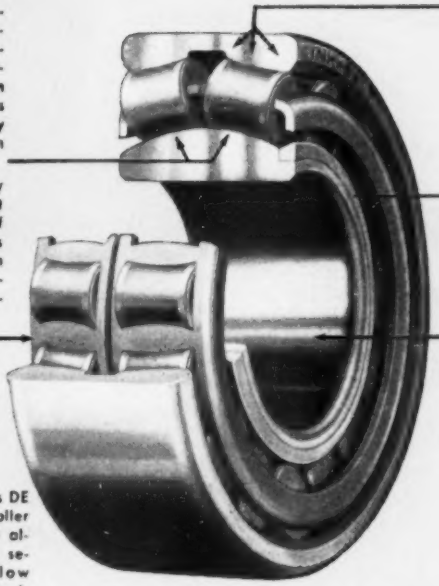
Construction Equipment



Textile Machines

roller bearings

America's hardest-working machines


integral self-alignment—angular contact of concave rollers operating between convex raceways — inner raceway free to move in any direction.
Full load capacity for radial, thrust or combination of radial-thrust loads is assured even with shaft deflection or misalignment.
Accurately formed, hardened steel retainers space and guide the rollers.
Rollers are naturally positioned by their concave shape, assuring free rolling and eliminating end friction — no pinching or binding of rollers.
Bearing parts are assembled to proper clearance and locked together as a complete assembly.
Straight bore mounting for press fit direct on shafting. Tapered adapter sleeve also available for use with commercial shafting where ready means of removal and installation of bearing are advantageous.

Cutaway of Series DE Self-Aligning Roller Bearing. Link-Belt also offers a wide selection of pillow blocks, flanged, flanged cartridge, cartridge, hanger and take-up blocks.

LINK-BELT

BALL and ROLLER BEARINGS

IN addition to meeting industry's requirements for mounted ball and roller bearings, Link-Belt builds integrally self-aligning roller bearings. Concave rollers between convex raceways provide angular contact for ample capacity under *both* thrust and radial loading.

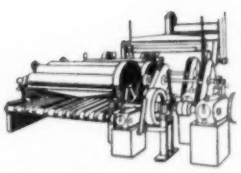
As on all Link-Belt bearings, precision manufacture assures you of long-life, free-rolling shaft support. Preadjusted for clearance at the factory and packed to reach you in "final inspection" condition, they require no adjustment when you're ready for installation.

Next time you specify bearings for one of your machines, call the Link-Belt office near you. They'll put you in touch with a Link-Belt bearing engineer who can give you expert advice on *any* bearing application. You can also get all the facts from Data Book 2550.

LINK-BELT COMPANY: Plants: Indianapolis, Chicago, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

11,220

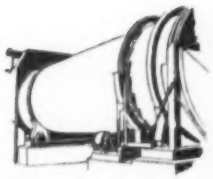
smooth the path of power for all industry



Pulp & Paper Machinery

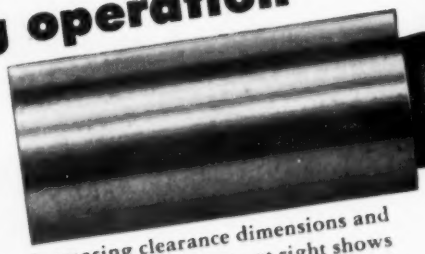
Materials Handling Equipment

Oil Field Equipment



Processing Equipment

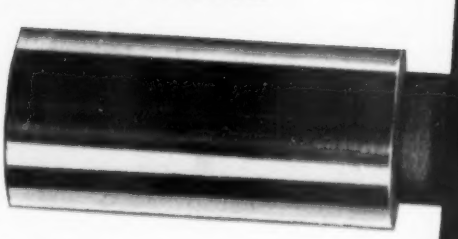
how SURFACE DEFECTS impair bearing operation



No matter how smooth a ground surface may appear, examination will reveal imperfections in the form of grinder scratches and ridges, feed spirals, chatter marks and partially loosened metal splinters. Upon contact, these minute peaks and ripples interlock with the mating surface of the bearing, tending to rupture the protective oil film. Fragmented metal is torn from surfaces to mix with lubricant and cause abrasive wear, increasing clearance dimensions and shortening life. Photo at right shows an example of a scratched and galled surface which stopped rotation by "plowing" metal.

how SUPERFINISH insures bearing life

Superfinish removes all surface defects such as grit scratches, feed spirals and the soft "smear metal" caused by grinding heat, and having removed the faulty layer—gets down to metal of the desired structure and hardness. At the same time, it produces a more nearly perfect geometrical form which supports a more efficient oil film for lubrication. There are no projecting defects to churn the oil film or cause metallic contact.



Load carrying capacity is substantially increased by Superfinishing. And bearing life is greatly prolonged.

you should know the facts about

SUPERFINISHING!

It may surprise you to know what a quick and inexpensive process Superfinishing really is. It can greatly reduce the cost of grinding and, in many cases, eliminate such expensive operations as hand lapping and polishing.

If you have not yet read the booklet "Wear and Surface Finish," we will be glad to send you a copy of this authoritative text book with our compliments. Please request it on your company letterhead.

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

1878 75 1953
YEARS OF ELECTRICAL PROGRESS

Why rotors don't fail in G-E TRI CLAD motors

G-E pioneering and research developed and produced this one piece cast-aluminum rotor winding, which has virtually eliminated rotor failures in Tri-Clad motors.

Rotor is indestructible in service because the bars, end rings, and fans are a "one-piece" casting. No brazed joints, no fabricated fans to come apart.

Rotor inertia is reduced by the lightness of the aluminum, thus raising efficiency and allowing easier starting, stopping and reversing.

Rotor efficiency is higher, operating losses reduced, as the result of a special chemical treatment.

The motor runs cooler because the integrally cast fans dissipate heat faster.

Operation is smooth and quiet due to the dynamic balancing of the rotor which also reduces bearing wear and material fatigue.

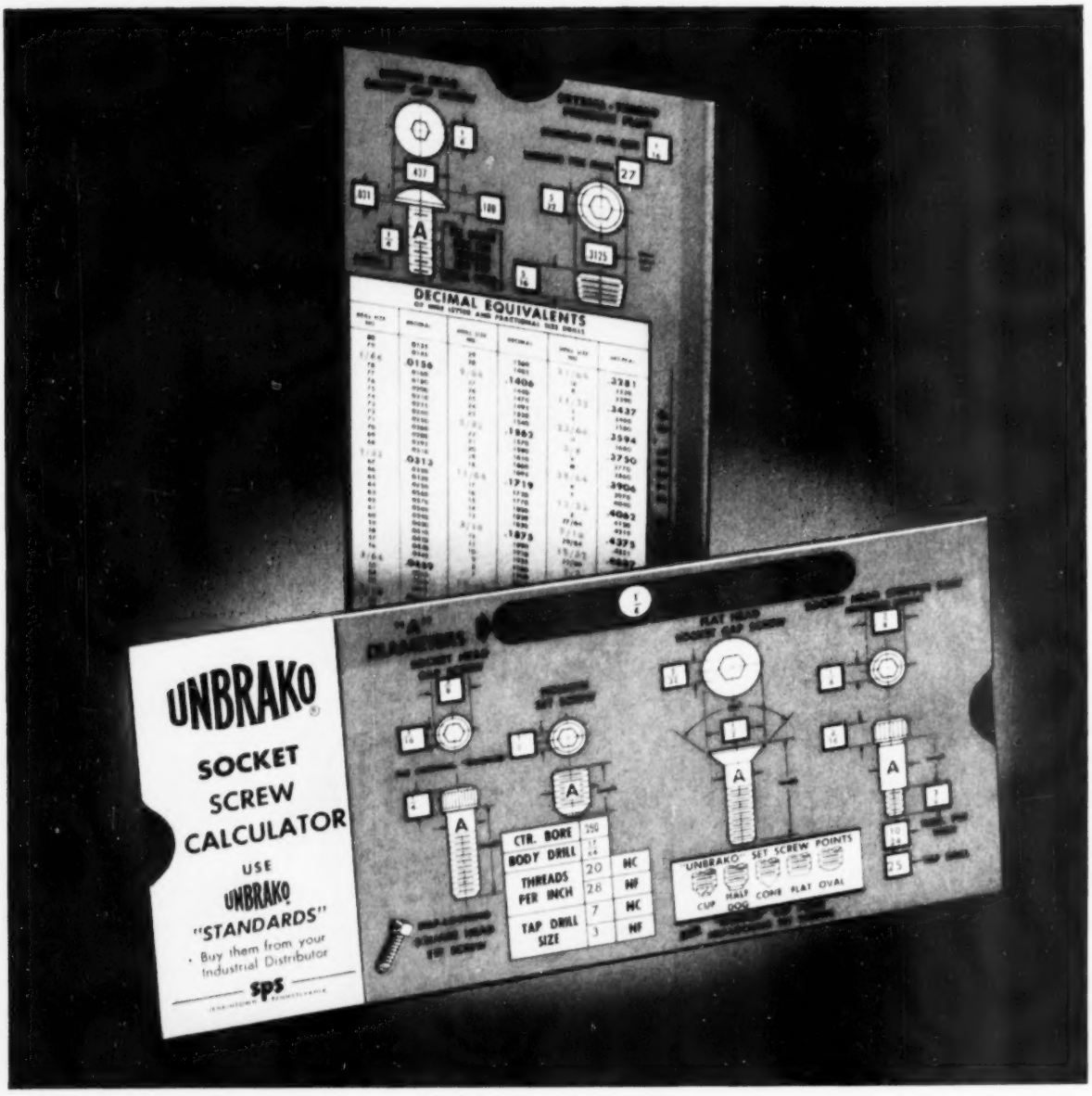
Long rotor life is one more reason why G-E Tri-Clad motors last longer — give you more reliable service and greater operating economy.

Order Tri-Clad motors today from your nearby G-E representative. You'll find popular models in stock. General Electric Co., Schenectady 5, N. Y.

752-20

You can put your confidence in—

GENERAL ELECTRIC



Our New UNBRAKO Socket Screw Calculator—YOURS FOR THE ASKING

This handy pocket-sized slide-rule type socket screw calculator gives diameters, lengths, socket dimensions, threads and drill sizes—in fact, everything you want to know when using UNBRAKO socket screw products. And it's free.

Ask your UNBRAKO distributor, or write to SPS, Jenkintown 1, Pa.

Standard UNBRAKOS *sold by leading industrial distributors everywhere.*

UNBRAKO®

SOCKET SCREW DIVISION

Our Fiftieth Year : A START FOR THE FUTURE

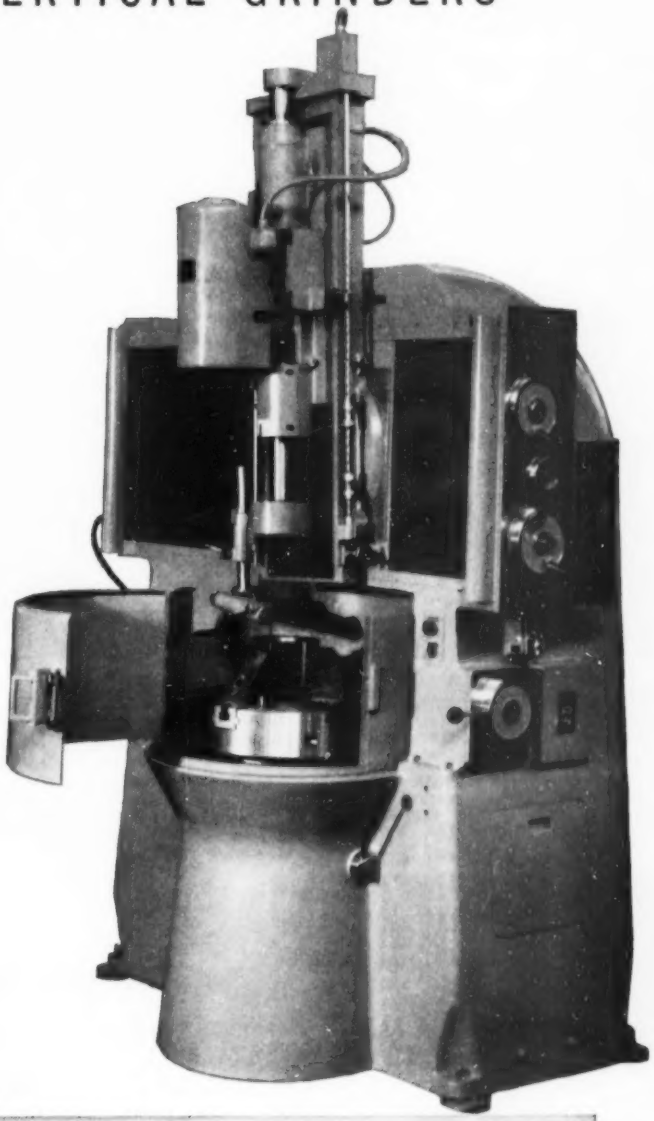
SPS
JENKINTOWN PENNSYLVANIA

Self-Locking Set Screws • Flat Head Cap Screws • Shoulder Screws • Knurled Head Cap Screws • Dowel Pins • Button Head Socket Screws

Consider these

3 OUTSTANDING Advantages of

SPRINGFIELD VERTICAL GRINDERS



ALL SLIDEWAYS ABOVE GRINDING WHEEL

protected from abrasive dust and grit ... LONGER LIFE.

NO GRAVITATIONAL PULL

to throw work out of line. Work sets solidly on vertical spindle ... GREATER ACCURACY.

EASE OF OPERATION

All controls conveniently located at normal height; greater work visibility; easier loading

... HIGHER PRODUCTION.

PLUS the added advantage of GREATER VERSATILITY

Grind combinations of O.D., I.D., faces, tapers, shoulders or steps with one set-up. Hold extremely close related tolerances.

Springfield Vertical Grinders are thoroughly proved by 14 years of time-saving, cost-saving precision production. Various capacities to 42" swing x 24" hole depth.

Write for Catalog 183

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD, OHIO, U. S. A.

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6

EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES

DELTA MILWAUKEE

DELTA QUALITY MAKES THE DIFFERENCE

DELTA Means VERSATILITY—

In one line at the Astatic Corp., 18 Delta drill presses work interchangeably on such materials as steel, zinc, plastic thermo and bakelite, aluminum and brass. Overhead lines carry power and air and are set up so that additional machines may be moved in and out of the line as job conditions change.

DELTA Means MOBILITY—

Says Astatic: "An example of how we move our Delta tools to the job is the case of putting two 17 inch drill presses side by side so that a piece can be countersunk on one, tapped on the other by the same operator. In many cases we move Delta tools to the material instead of the material to the machine."

DELTA Means ACCURACY—

"With simple fixtures and Delta accuracy we make jobs practically fool-proof on machines which almost run themselves," reports the Astatic Corp. Astatic products for the communication industry are manufactured to high precision standards.

Down Go Costs

WHEN ASTATIC CORP. PUTS DELTA TOOLS ON JOB

These Production Ideas Will Work For You, Too.

Here's how the Astatic Corp., Conneaut, O., gets high production and high precision at low cost with a shop full of Delta tools—drill presses, grinders, bandsaws, table saws, jointers and belt sanders. This story of a manufacturer of microphones, radio, phonograph and television parts can apply equally well to your plant.

FLEXIBILITY — Because Delta tools are light and mobile, Astatic takes them to the material to be machined, cutting handling costs. They are moved in and out of the production line as jobs change, already set up to eliminate down time. As many as five different materials from steel to plastics are machined on the same Delta tools.

INTERCHANGEABILITY — By standardizing on Delta, Astatic uses the same jigs and fixtures on several machines without adjusters.

FEWER SET-UPS — By keeping machines set up for special jobs one operator can tend several machines and do sequence operations on a single part before laying it down. No waste motion. Because Delta tools are a low capital investment, they don't have to run constantly to pay out.

QUALITY — Most of the Delta tools at Astatic have been on the job six to nine years with only routine maintenance. The Astatic record proves that Delta gives you machine tool quality at a cost any production operation in your plant will justify.

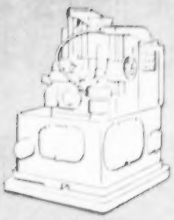
Do you have an up-to-date catalog of Delta tools? Call your Delta dealer. He's listed under "Tools" in your Classified Phone Book. Or write direct to Delta Power Tool Division, Rockwell Manufacturing Company, 618H N. Lexington Avenue, Pittsburgh 8, Pa. Ask for Catalog AB52.

DELTA Means LOW COST—

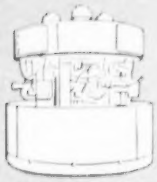
Here's the Astatic story: "Because the cost of Delta tools is low, it is advantageous to maintain set-ups even if they are used only intermittently. Often an operator performs an operation on one machine, then turns to another for the second operation, saving the cost of repeated set-ups."

DELTA QUALITY POWER TOOLS

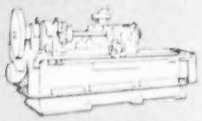
Another Product by **Rockwell**



12-S HOBBER

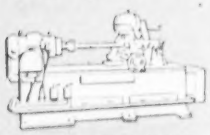


7-A ROTARY HOBBERS

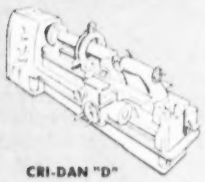


SH SPLINE HOBBER

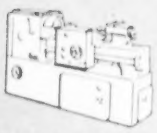
MODEL 40 THREAD MILLER



HT THREAD MILLER

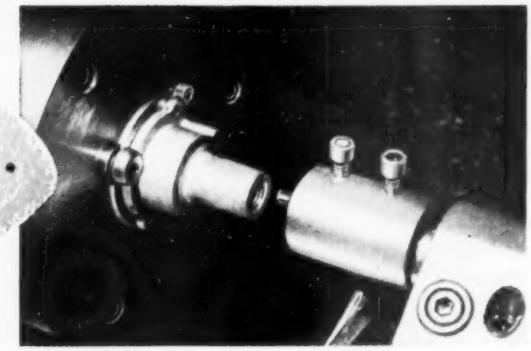


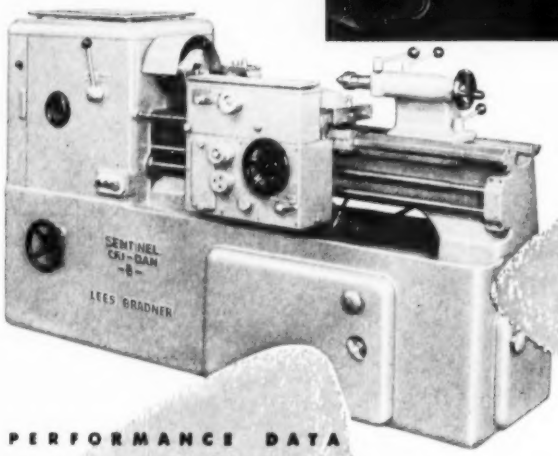
CRI-DAN "D"



CRI-DAN "B"

SMALL PART...





BIG SAVINGS

PERFORMANCE DATA

Material	Die cast aluminum
Thread produced	⅜"-18 UNF 2B internal
Thread length	⅜" full thread
Depth C'bore for thrd.	7/16"
RPM	2000
Number passes req'd	8
Type tool	Carbide
Approx. pcs per grind	7500
Cutting time	8 seconds
Floor to floor time	15 seconds

with the CRI-DAN "B"

SINGLE POINT THREADING MACHINE

● Again, the Cri-Dan Threading Machine proves its amazing efficiency.

This small aluminum casting, formerly threaded on a tapping machine was set up on the Cri-Dan "B". The finished casting required a ⅜"-18 class 2B internal thread cut to within 1/16" of the shoulder. When the Cri-Dan " took over," the scrap loss due to concentricity was completely eliminated, thread depth was consistently maintained and overall production increased.

This case history of a leading manufacturing company* proves again that your Lees-Bradner representative can help increase your savings on threading operations. Contact him today.

*name on request

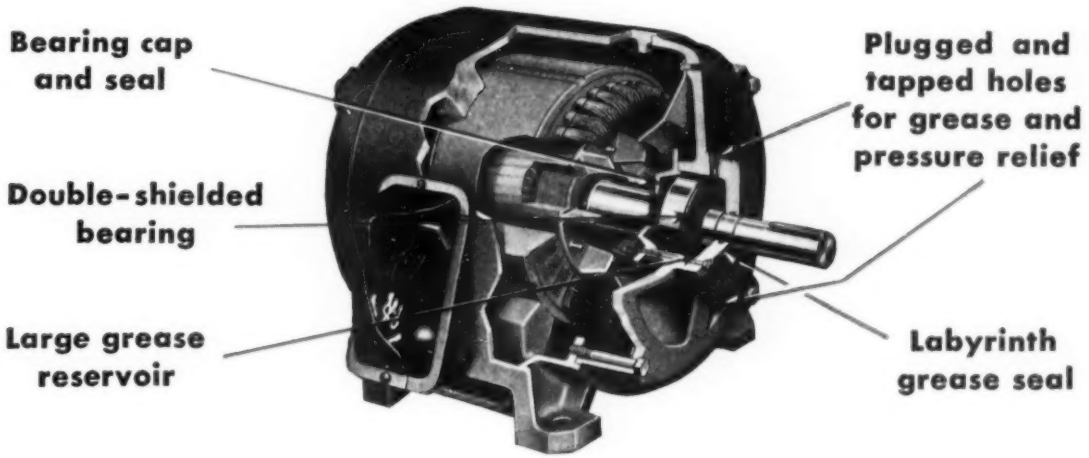
the LEES-BRADNER® Company

CLEVELAND 11, OHIO, U.S.A.

Here Are Facts You Should Know About **Electric Motor Bearings**

An ideal motor bearing would operate for indefinitely long periods under all types of conditions without requiring any attention whatever. However, in the opinion of our engineers, such a bearing and its attendant lubricant are not yet available on the commercial market. Consequently, bearings for many types of operations, particularly where overloading, extreme temperature ranges and chemical and dirt laden atmospheres are involved, require special lubricants or regular lubrication schedules.

Of course, bearings suitable for many kinds of operation under normal conditions can be built to require no attention for very long periods — usually several years. Allis-Chalmers can supply sealed bearings in all frame sizes through 505 on short delivery and without extra cost for applications of this type.


Bearing cap and seal
Double-shielded bearing
Large grease reservoir
Plugged and tapped holes for grease and pressure relief
Labyrinth grease seal

Which is the Best Design for *Your* Application?

But, we believe that the design used in standard Allis-Chalmers drip-proof, tefc and explosion-proof motors represents the best design for most industrial users.

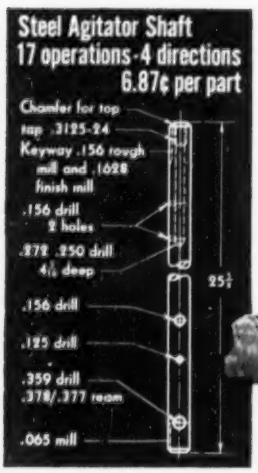
The Allis-Chalmers standard design consists of a prelubricated, double-shielded bearing mounted in the end housing with a generous grease reservoir. Plugged and tapped holes are provided for grease and for pressure relief. Under normal operating conditions, this design will operate as long without attention as any other type of bearing in use today. But where difficult operating conditions make relubrication desirable, it can be done as part of the normal lubricating-routine without dismantling the motor.

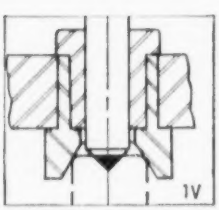
The large grease reservoir and shielded bearing design assure that grease lost from the bearing due to high operating temperatures or other causes will be replaced automatically.

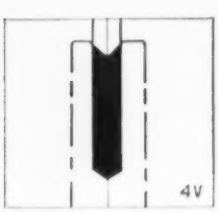
For further information on bearing design and other features of Allis-Chalmers motors, call your nearby Allis-Chalmers District Office or Authorized Distributor. A-4130

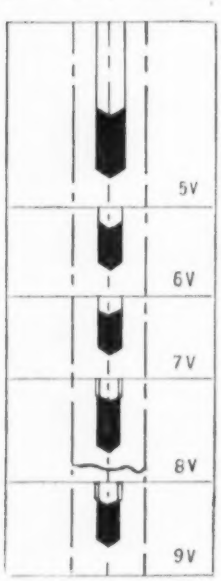
ALLIS-CHALMERS

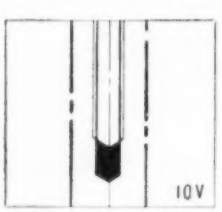
Combine Operations on a Kingsbury and turn

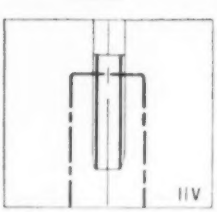


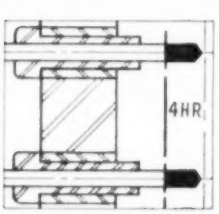


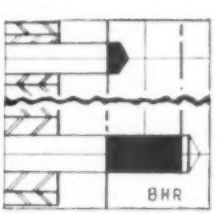












In one cycle through this Kingsbury, each of

This steel agitator shaft presented interesting problems: its shape, for one thing. It is 25⅝ inches long and ⅜-in. O.D. It has a keyway at each end, and an axial hole 4⁵⁄₁₆ inches deep. Two ports enter this hole at 90°, and three horizontal holes are drilled through the shaft at 90° to these ports.

The Kingsbury has 11 units and an air-operated stamp mounted on the central column. Six units are mounted on the base; 12 work-holding fixtures are mounted on the 60-in. index table. Each fixture presents its work to cutting tools at 11 stations. One operator loads and unloads.

Axial Hole: To speed production, this hole is completed in 9 steps. Customer allowed these steps to vary from a start of .272 dia. to .250 dia. — a great help!

Unit IV: .343 at 45° spot for countersink. Sliding drill bushing carrier is piloted to top of work for concentric start of hole.

Drilling Units: 4V thru 10V complete the hole to a depth of 4⁵⁄₁₆ inches.

Unit III .3125-24 taps hole ¾-in. deep.

out many parts per hour at low cost per part

You can combine your drilling, c'boring, reaming, tapping, light milling, recessing, spotfacing or threading operations — and reduce your costs.

Your part can be of any metal or material that can be machined economically. It must be of a size and weight which can be machined within the limits of 5 HP units and be handled efficiently by your operator. You must want a lot of parts per man-hour, because you'll get high production.

You'll get uniform accuracy. Your scrap loss will be reduced to a minimum. You'll save floor space. You'll eliminate re-handling. In fact, you'll be very happy about the whole thing!

Now, a word about the costs quoted in this advertisement. These costs amortize the entire Kingsbury investment over 6000 hours. This is a fraction of its useful life! They include the cost of the man and machine, but no power or overhead.

They assume unit cost of the man to be:

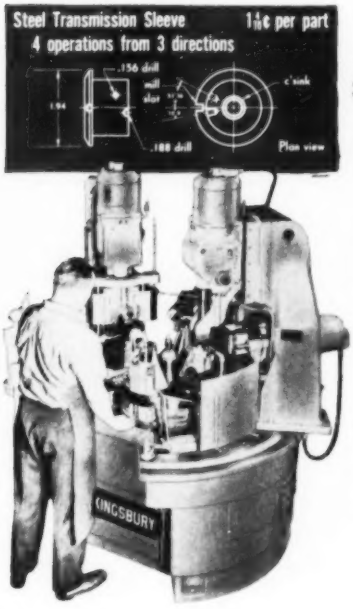
$$\frac{\text{average U. S. hourly wage}}{\text{hourly gross X 80\% efficiency}}$$

They assume unit cost of machine to be:

$$\frac{\text{price of tooled machine}}{\text{output in 6000 hrs. at 80\% efficiency}}$$

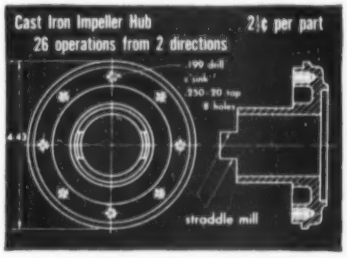
Each Kingsbury machine is custom-built to do a specific group of jobs — and is given a trial run for your approval of the machined part before delivery. Are you really interested? If so, we'd like to see you.

Kingsbury Machine Tool Corp.
103 Laurel St., Keene, N. H.



← Steel Transmission Sleeve
350 parts per hour gross—1-4/10¢ each

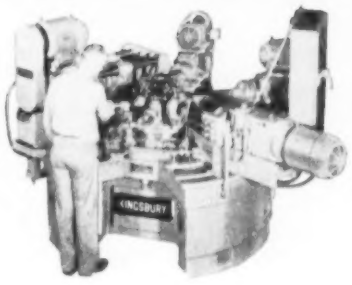
Note plan view drawing — it shows the angles. Four work fixtures are located on a 20-in. index turret. All work is performed at three stations. Two horizontal and two vertical drilling units are mounted on the 60-in. base. One vertical drilling unit has a milling attachment with side adjustment to compensate for cutter wear. Work fixtures are unclamped automatically at the unloading station.

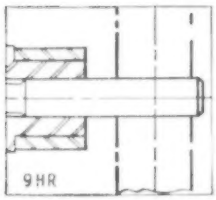


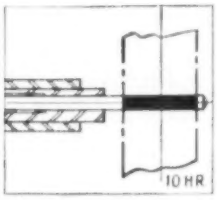
Cast Iron Impeller Hub →
204 parts per hour—2½¢ each

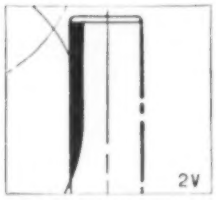
In this Kingsbury the units are located on the 80-inch base, and the work fixtures on a 26-in. turret. There are 8 stations.

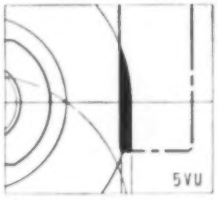
The machine performs 26 operations. Eight holes are drilled, c'sunk and tapped. But the milling operation is the most interesting. A milling unit is attached to a drilling unit equipped with a 7-in. stroke attachment. Cutters feed from right to left through the work, straddling the material.











12 parts receives 17 operations from 4 directions

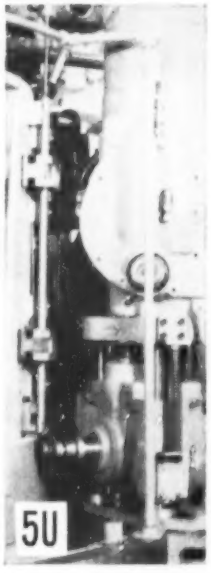
Horizontal Holes: Drills are located accurately by sliding tool guide bushing carriers piloted to each work fixture.

Unit 4H (right) has a 2-spindle auxiliary head — drills two .156 holes thru into axial hole on center line of keyway. *Unit 8H* (right) operates 2 spindles — drills .156 and .359 through shaft. *Unit 9H* (right) reams the .359 hole to .378/.377 diameter. *Unit 10H* (right) .125 drills through.

Keyways: At top of shaft, .156 wide keyway is rough- and finish-milled by units at 2V and 3V. At bottom of shaft keyway is milled .065 wide by *Unit 5U* (under), as shown in photograph at right. All milling units can be adjusted to maintain accuracy.

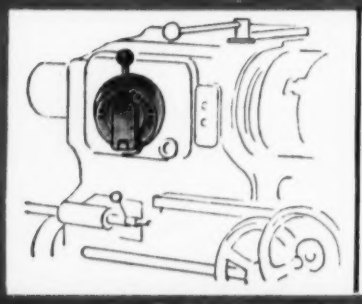
* * *

At Station 12 (where operator loads and unloads the machine) an air-operated identification stamp works on top end of the shaft just prior to the unclamping of the work-holding fixture.

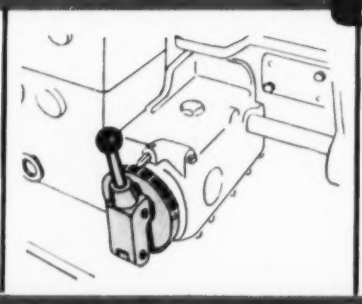


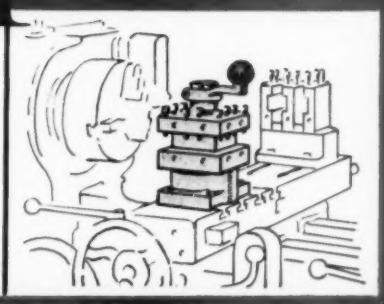
another reason why J&L turret lathes produce

MORE CHIPS PER TOOL
MORE PIECES PER HOUR
MORE PROFIT PER JOB

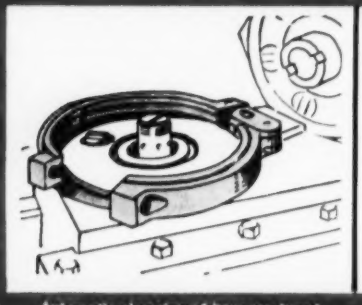


Single lever speed and feed selectors – preselector type.

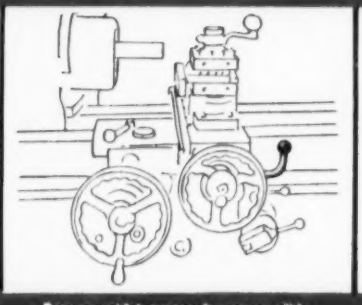




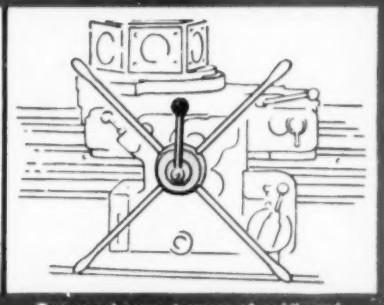
Quick indexing – self-locking – square turret.



Automatic clamping of hexagon turret.



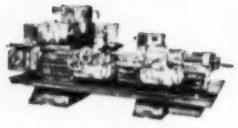
Power rapid traverse for cross slide.



Two-speed power traverse of saddle and power indexing of hexagon turret on all saddle type machines.

MORE EASE OF OPERATION!

J & L Turret Lathes are the easiest to operate, because controls are fewer, simpler and easier to reach. The operator can select the speed and feed for the *next* cut while machine is operating. Power rapid traverse for the cross slide, two-speed power traverse for the saddle and power indexing of the hexagon turret, also help take the strain off the operator and increase your production.



P.S. Power bar feeds and chucks, and power torque chuck wrenches are also available. Write to Dept. 710 for Catalog.

"World's most accurate and powerful turret lathes"

RAM TYPES: Bar, 1½" to 4½", Chuck, 10" to 12". SADDLE TYPES: Bar, 2½" to 5", Chuck, 12" to 18".

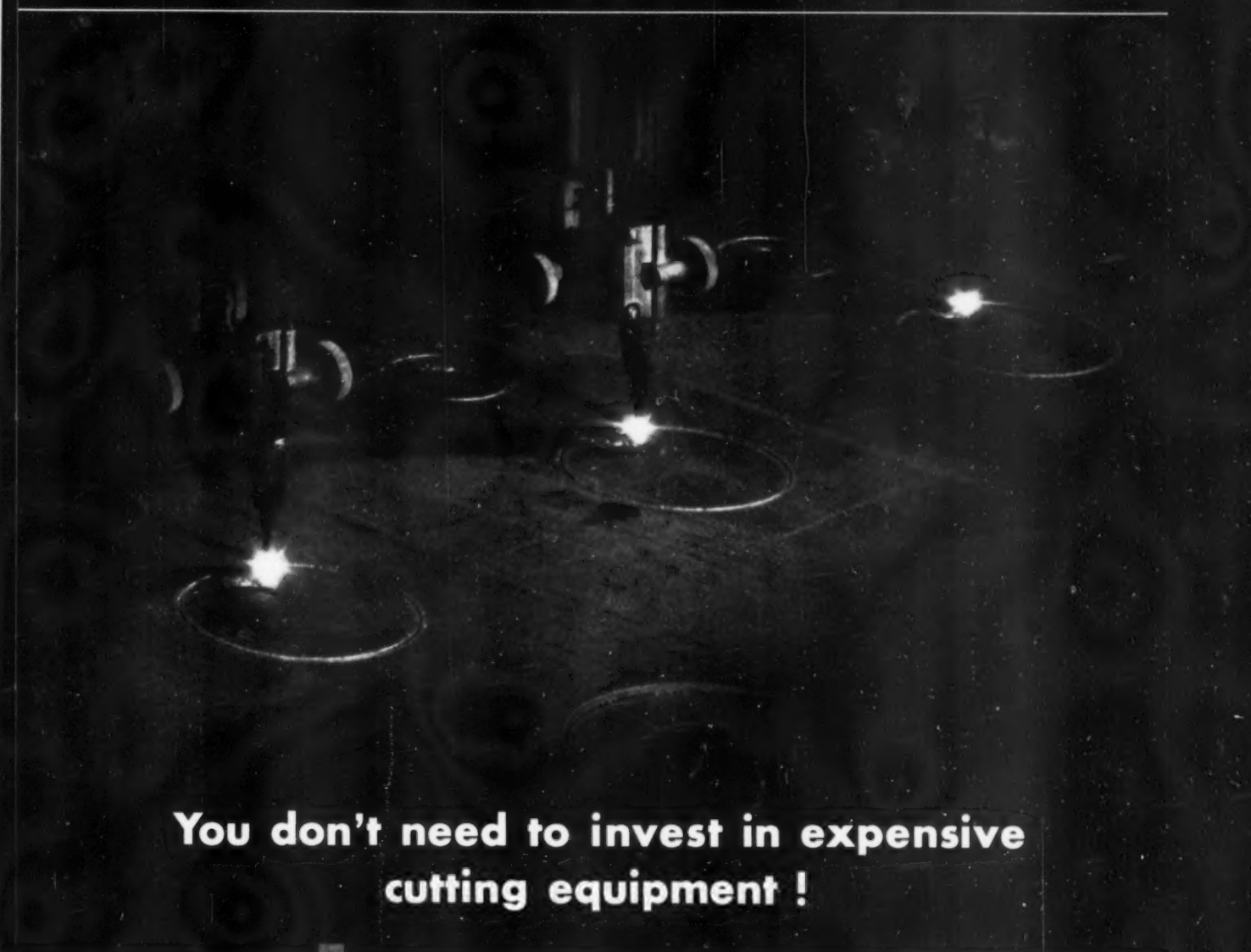
JONES & LAMSON

Machine Tool Craftsmen Since 1835

JONES & LAMSON MACHINE CO., 502 Clinton St., Dept. 710, Springfield, Vt., U.S.A.

J&L TURRET LATHE DIV.

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE



You don't need to invest in expensive cutting equipment !

WHEN YOU BUY STEEL FROM WAREHOUSE YOU GET:

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

TYING up money in large, expensive steel-cutting machinery is something you can avoid, if you wish. Yet you can have your cutting done on the most modern equipment available. When you order your steel from U.S. Steel Supply, specify just how you want it cut. We will meet these specifications exactly. For example, our flame cutting equipment will follow the most complicated patterns without error and turn out finished shapes precisely as you want them. Your U.S. Steel Supply salesman will give you complete information about our cutting services.

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DIVISION

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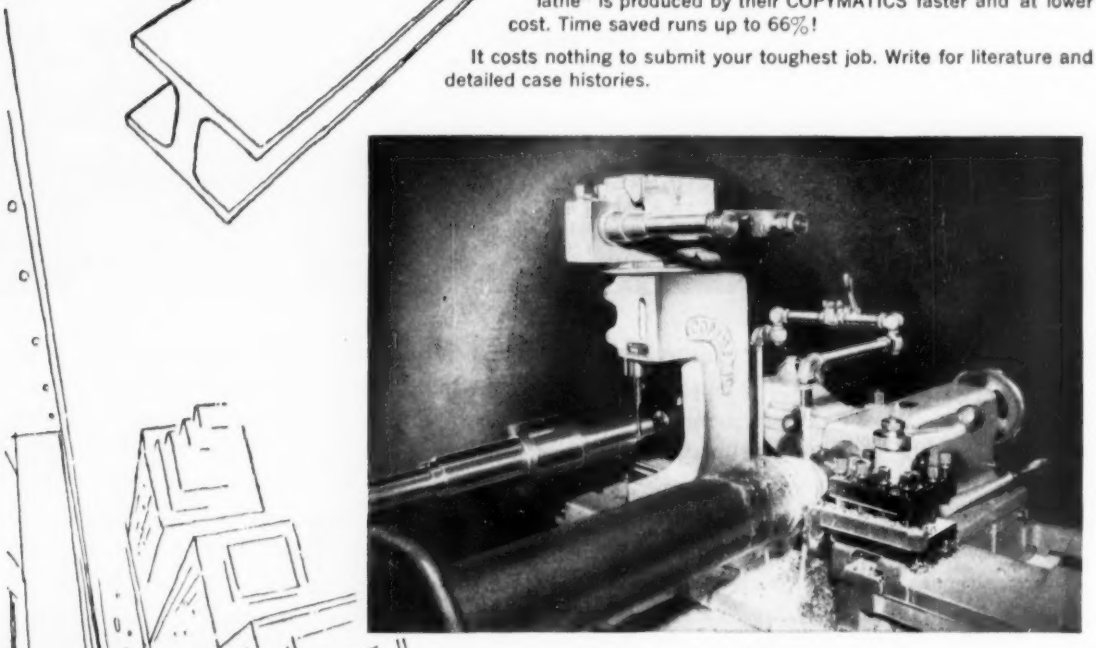
UNITED STATES STEEL

How HIGH is UP ?

Production soars "up and up" with COPY-MATIC Lathes! Case histories prove it!

At the D. O. James Gear Mfg. Co., Chicago, Lodge & Shipley Model X COPYMATICS are beating the output of former lathes by "2 to 3 times" consistently. This customer reports "anything that is turned on a standard lathe" is produced by their COPYMATICS faster and at lower cost. Time saved runs up to 66%!

It costs nothing to submit your toughest job. Write for literature and detailed case histories.



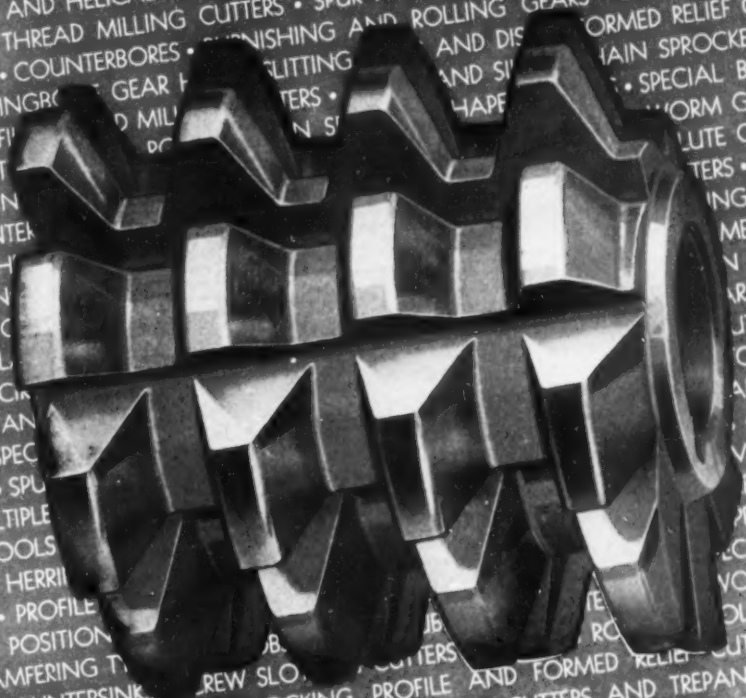
THE **Lodge & Shipley** COMPANY

3059 COLERAIN AVE. CINCINNATI 25, OHIO

FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.



Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 engineers and manufacturers of high-quality special cutting tools for the metal-working industry

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

Red Shield says:

"STANDARD for tough jobs since 1881"

as near as your telephone

Call your Industrial Supply Distributor for Shield Brand Taps. Specialized factory service available everywhere.

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NEW YORK • DETROIT • CHICAGO • DALLAS • SAN FRANCISCO

THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*

Facts you should know about Kearney & Trecker's Special Machinery Division

If you're a potential buyer of special machines or special tooling – read about our expanded facilities

THOUGH we've been designing and building standard and special machine tools since 1898, limited production facilities for special machines previously prevented us from offering these services on a wide scale.

But now, our Special Machinery Division has new and greatly expanded facilities. Its exclusive job will be to build special machine tools and tooling or specially to adapt standard equipment to solve specific metalworking problems.

Check our qualifications:

EXPERIENCE: We've been in the business 55 years. In addition to being one of the country's leading producers of standard milling machines . . . *our production of special machinery has ranged up to $3,000,000 annually.*

FACILITIES: The new Special Machinery Division plant, built on a 38-acre site, is equipped with more than *$2,500,000 worth of new tools and equipment.*

PERSONNEL: The Special Machinery Division engineering section has nearly 100 experienced design and production engineers at its command. These men specialize in applying to metalworking the latest developments in mechanics, hydraulics, electronics, metallurgy and allied fields. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

PERFORMANCE: Kearney & Trecker's Special Machinery Division is best recommended by its record of successfully solving hundreds of unusual machining problems. These include high production requirements as well as exacting dimensional accuracies and surface finishes.

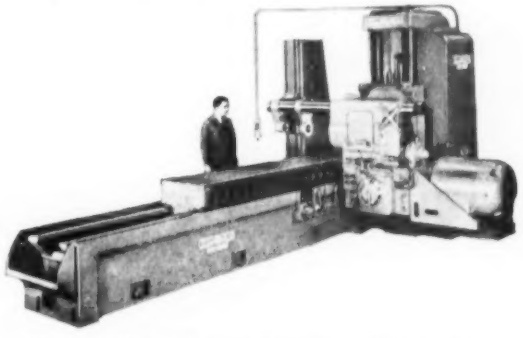
RESPONSIBILITY: Our Special Machinery Division is an integral part of the Kearney & Trecker Corporation . . . and is fully supported by all its financial, physical and personnel resources.

Any commitment for a product of this division is a commitment that fully involves the accepted reputation for responsibility and satisfaction that is Kearney & Trecker's.

We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a 50 hp CSM Simplex milling machine we designed and built for a leading manufacturer.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Hundreds of hours longer...

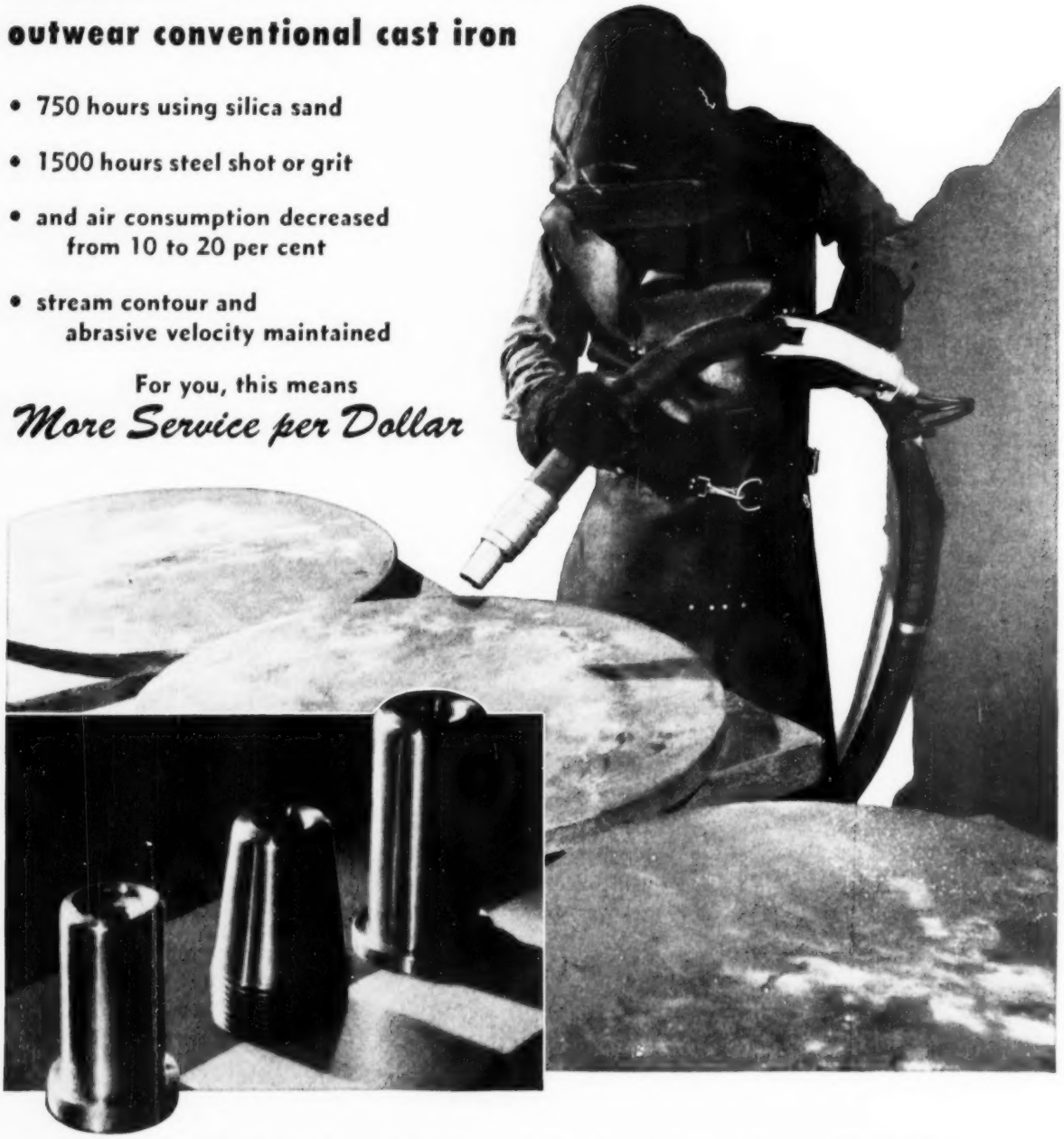
NORBIDE® Pressure Blast Nozzles

outwear conventional cast iron

- 750 hours using silica sand
- 1500 hours steel shot or grit
- and air consumption decreased from 10 to 20 per cent
- stream contour and abrasive velocity maintained

For you, this means

More Service per Dollar



Only the diamond is harder than Norbide

NORTON® **NORTON COMPANY**

WORCESTER 6, MASSACHUSETTS

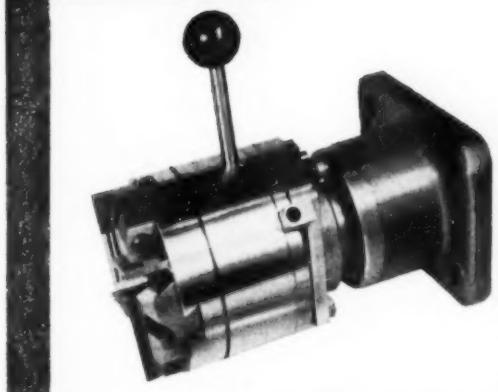
Making better products to make other products better

HOLDERS

for Jones & Lamson Die Heads

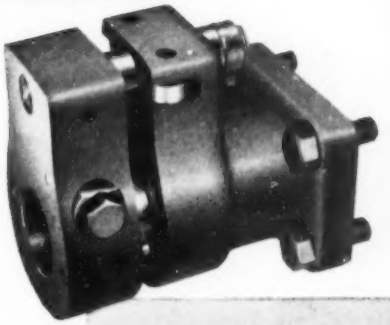
The best of Die Heads deserves the best of holders. With these holders, the extreme accuracy of your J&L Die Heads is reflected in the quality of the threads they produce. Holders for J&L Die Heads are available for most makes of turret lathes. Mail this coupon for a copy of the new illustrated catalog.

LEVER OPERATED DIE & TOOL HOLDERS
for more sensitive control. Eliminate side trimming. Hold reamers, taps and small drills.



FLANGE TYPE HOLDERS
ideal for threading long work that must pass through the face of the turret.

AXIAL FLOAT HOLDERS
for smooth, shock-free starting, better finish threads.



P.S. --- *Write for Catalog!* --->

JONES & LAMSON

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502 Clinton St., Springfield, Vermont, U. S. A.

Machine Tool Craftsmen Since 1835
DIE HEAD DIV.
Dept. 710

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Springfield, Vermont, U. S. A.

Please send Catalog No. 504 "Holders for J & L Die Heads".

NAME _____ TITLE _____

COMPANY _____

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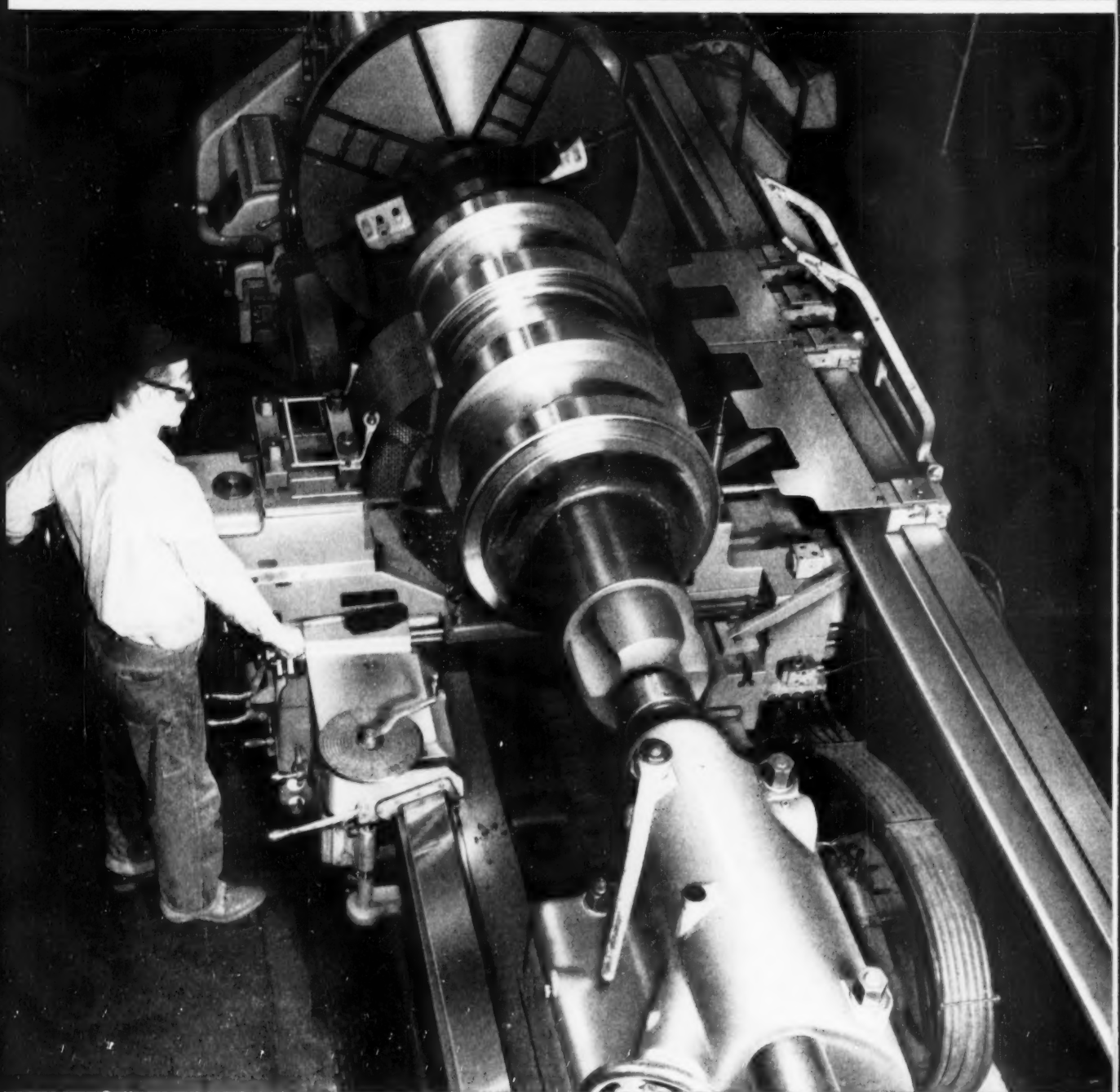
CITY _____ STATE _____

LeBlond Lathe eases cost squeeze ...on rolls that

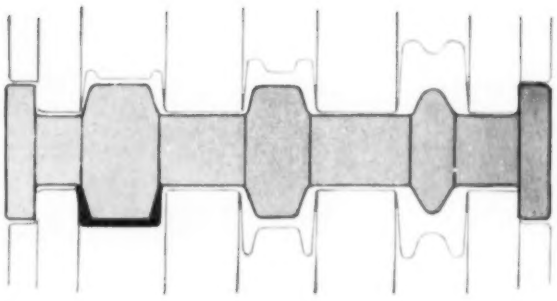


Shape rolls of 30½" dia. x 51" body cast alloy semi-steel are turned to .005" tolerance in 94 hours on this 50" LeBlond Roll Contouring Lathe. Set-up time—¾ hour. Clamped-on and brazed-on carbide tips are used at 48 rpm, .040 ipr feed. Conventional roll lathe took 245 hours for the same job.

squeeze channels from ingots

U. S. Steel Lops 151 Hours Off 245-Hour Roll-Turning Job.

Every day at U. S. Steel's Clairton Works, Clairton, Pa., miles of "hotter-than-orange" steel are squeezed through the passes of rolls like these for reduction, elongation, shaping. They come out as finished structural steel for the "jungle-gym" frameworks of modern buildings. Turning these costly shape rolls with their steep-angle contours used to keep a lathe running *245 hours on a single roll* at U. S. Steel. Tool life was short and the job required highly skilled operators. Stepped-up schedules called for a new solution to this tough-nut production problem.



Typical roughing rolls for 8" channel

A LeBlond 50" Roll Contouring Lathe, purchased through Pittsburgh Distributor Barney Machinery Co., immediately slashed the 245-hour turning time by an astonishing 61.7%. Now U. S. Steel *saves 151 hours on each roll*—more than enough time to turn out two more just like it. Tool life is greatly improved and less experienced operators can handle the work.

The 50" LeBlond Roll Contouring Lathe is equipped with two-directional hydraulic tracing. A single valve automatically controls two hydraulic motors for cross and length feed. A stylus follows a flat template mounted at the back of the lathe. Feed and speed can be varied during a cut without leaving a tool mark. For roughing, hydraulic cross feed can be by-passed and length feed used separately. This enables operator to cross feed manually, use template as length stop. Mechanical power rapid traverse to carriage and cross slide is also provided. All controls are located conveniently at the apron. The lathe uses a 40 constant horsepower DC motor, has nine speed changes in the headstock, delivers infinitely variable speeds from 1 to 165 rpm.

Whether your turning jobs involve specialized production like roll-turning, or call for high precision, high production—investigate LeBlond's complete line of 76 lathe models. LeBlond engineers will help you get a better turning job, faster. Write today or see your nearby LeBlond Distributor.

Ask for complete information on Roll Contouring Lathes in 25", 32", 40" and 50" sizes.

Turned faster by

LEBLOND *of Cincinnati*

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

THREE CLEVELAND MODEL AB 2½" bar machines, equipped with chucking attachments and ingenious tooling, turn out difficult stainless steel part in record time at Solar Aircraft Co.

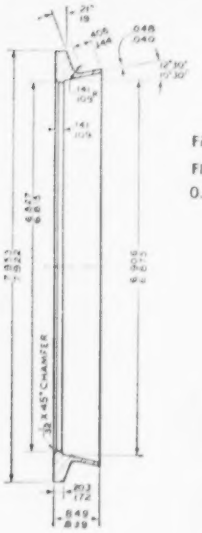
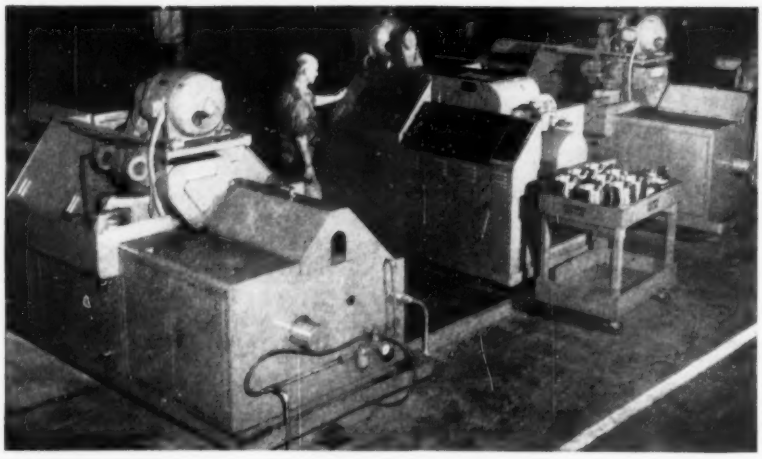


Fig. 1
Flange detail. Note 0.044" flared section



Cleveland "Dialmatics" speed delivery of jet-engine combustion chamber flanges

Solar Aircraft Co., San Diego, Calif., recently was faced with the problem of producing 4000 combustion chamber flanges per month for a jet-engine program. The part (Fig. 1 above) was to be machined from rolled and welded stainless steel rings $8\frac{3}{16}$" OD, $6\frac{3}{4}$" ID and 1" wide. The part required all-over finishing and had a flared section 0.044" thick to be machined to a tolerance of ±0.004" and an angular tolerance of ±1°. Forming this thin section proved impractical and it was found advisable to machine the part by single point turning and boring.

Turret lathes vs automatics

Equipment engineers at Solar first considered producing the part on turret lathes. Machining time was 45 minues per piece. Nine lathes and operators would have been needed to meet the required production. Automatics were then investigated.

After considering a number of machines, the Cleveland Model AB "Dialmatic" proved best suited for this job. This is a single spindle automatic, essentially a 2½" bar machine, which can be equipped with a *chucking* attachment capable of taking work up to the $8\frac{3}{16}$" OD ring. The machine has a spindle speed range of 24 to 1820 rpm, with four automatic speed changes. It has a 5-hole turret and two cross slides. Infinitely adjustable turret tool feeds are provided by an electric feed drive for both forward and return motions of the turret.

Permanent set-ups used

Photograph at top of page shows the Cleveland "Dialmatics" purchased for this job. The Clevelands were excellently tooled by Solar tool engineers to machine the part in three balanced operations with permanent set-ups as follows:

The first machine held the rough ring in an 8" chuck operated by a 10" air cylinder. Operations included turning, boring and facing the forward end of the part to finished dimensions. (See Fig. 2.) Carbide tools were used. Total time was 3.8 minutes per piece.

Fig. 2
First Operation

For the second operation, the part was chucked on the finished OD using minimum holding pressure. Carbide tools hogged out the balance of the OD and rough bored the tapered section. (See Fig. 3.) Over 6 cu. in. of material were removed in 5.6 minutes.

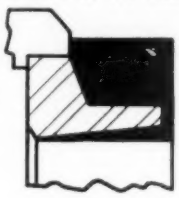


Fig. 3

Fig. 4

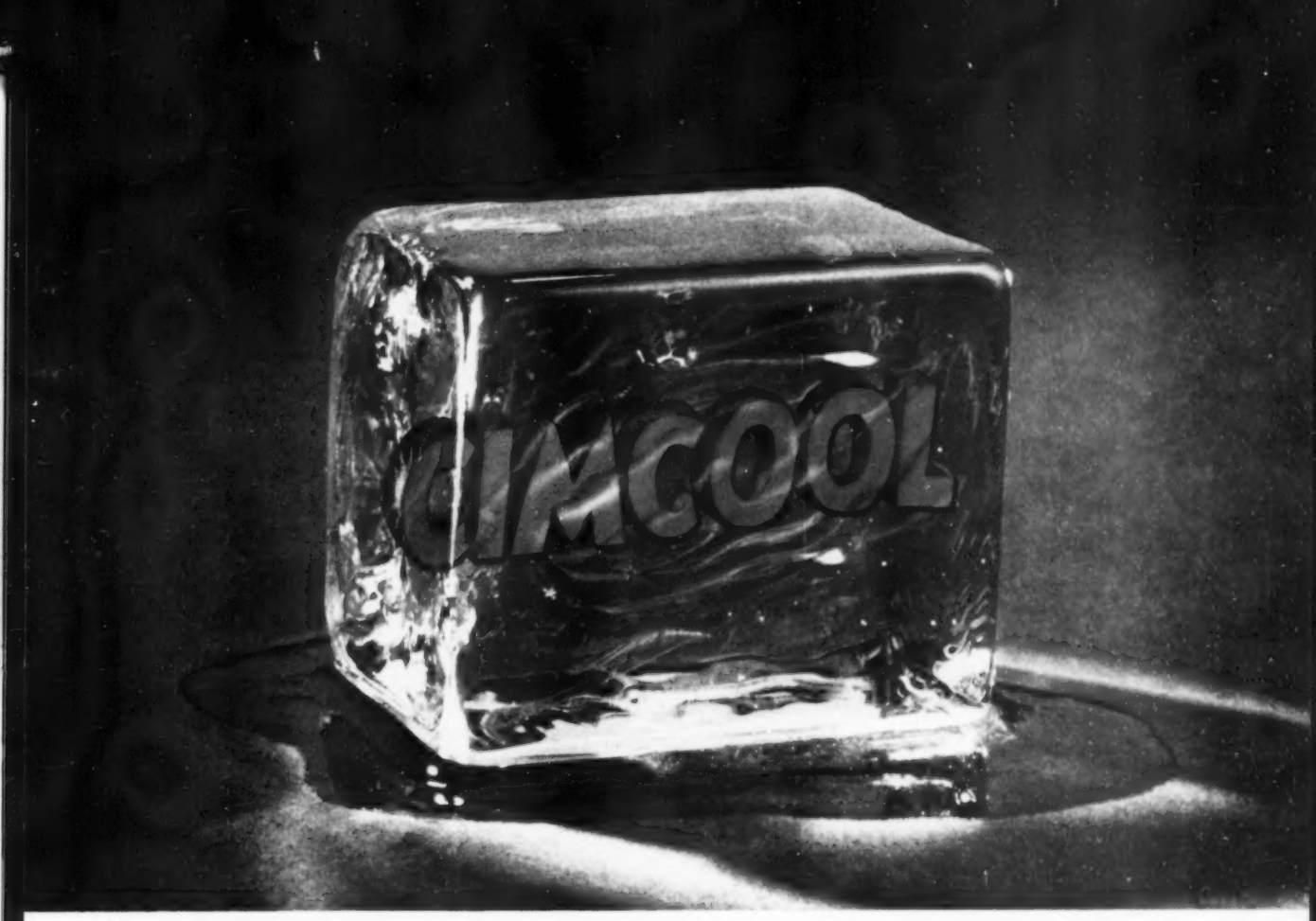
Second and third operations

The third Cleveland finished the piece in 6 minutes by turning and boring the flare and forming the clamping face. (See Fig. 4 above.) This difficult forming required heavy tool holders mounted in the turret. A ball bearing support, mounted on the cross slide, steadied the part during the forming cut.

Production time for the complete piece was 15.4 min., about one-third the time required to produce it on turret lathes. The sturdily designed Cleveland "Dialmatics" plus excellent tooling by Solar made possible this efficient installation which is helping to keep the nation's defense program strong and on schedule. Manufacturers interested in obtaining complete information on Cleveland "Dialmatics" should address their inquiries to:

THE CLEVELAND AUTOMATIC MACHINE CO.
4928 Beech St., Cincinnati 12, O.

This is an advertisement



COLD FACTS about the **HOTTEST IDEA** in the history of coolants . . .

CIMCOOL° is a radically new and different cutting fluid that lowers costs . . . permits faster speeds . . . increases accuracy . . . helps increase tool life . . . *and covers 85% of all metal cutting jobs!*

Cimcool is freezing out old-fashioned coolants in more and more plants every day because it's a *chemical emulsion*. It replaces all water emulsions and all but a few highly compounded specialty oils. Cimcool permits faster speeds and increases tool life because it combines friction reduction and cooling capacity in a degree never before attained. It's longer lasting in machines. So Cimcool reduces downtime and cuts labor costs for cleaning and changing.

For a demonstration, write us and we'll have one of our Cincinnati Milling-trained machinists call on you—without cost or obligation. Or, if you prefer, write for our free booklet, "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

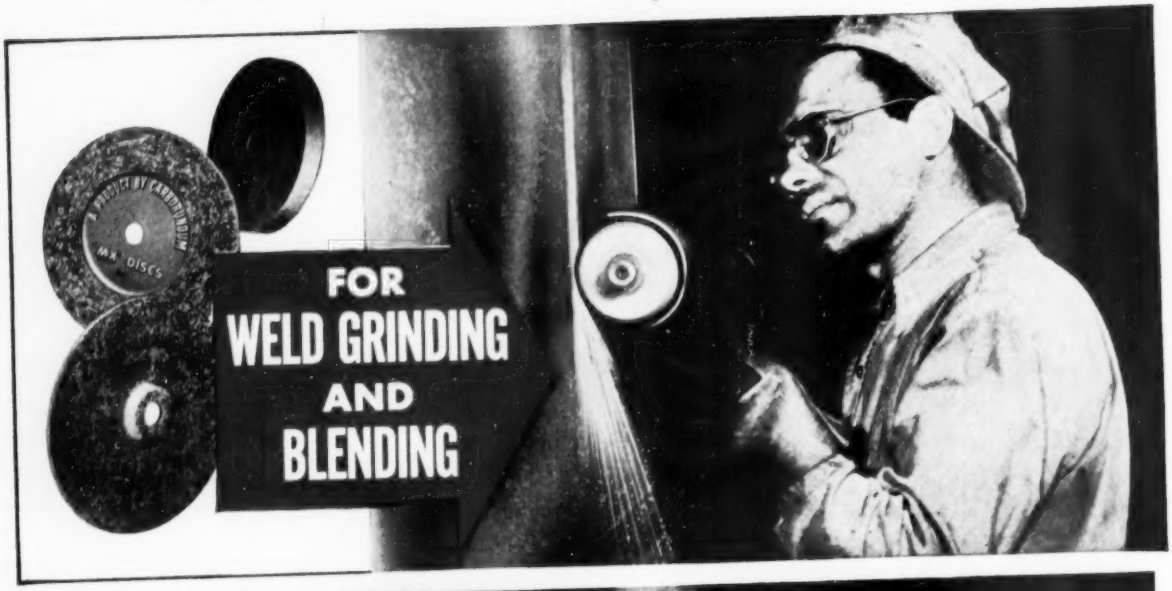
CIMCOOL

for 85% of all metal cutting jobs

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

Have you tried these MX abrasive products?

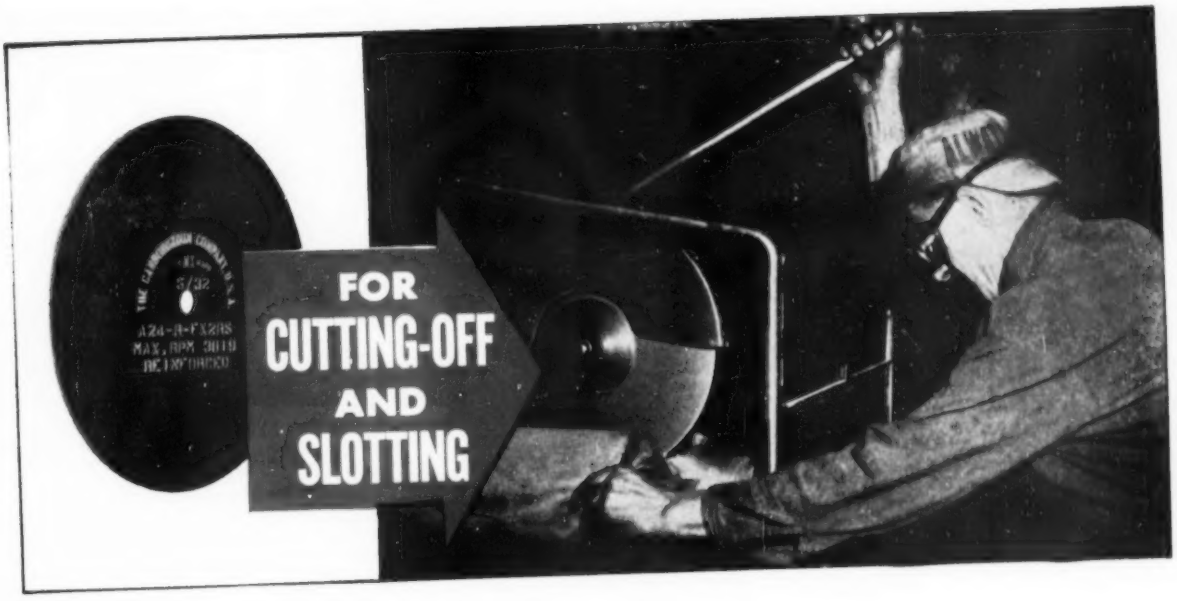
TRADE MARK



CARBO

TRADE

"Carborundum" and "MX" are registered trademarks which indicate manufacture by The Carborundum Company, Niagara Falls, N. Y.



Talk about versatility in grinding—MX products by CARBORUNDUM have it! For instance, one MX wheel reduces and blends rough stainless steel welds in one operation; another cleans out dainty decorative designs on sterling silver tableware; still another cuts through one inch black pipe in a matter of seconds. And these are but a few of the different kinds of work done by MX products every day!

MX abrasive products are in a class by themselves. They *finish* as they cut...they cut fast and clean... they resist loading—even on soft metals (they're tops for work on aluminum, for example), and alloys, or plastics, glass, and other non-metallics. They are *safe*, because of their high resistance to impact and heat shock. MX products work fast, wear slowly—remain usable right down to the arbor, shank or nut.

It's to your profit to find out what MX products can do for you—in any of these six forms: straight wheels, mounted wheels, cut-off wheels, discs, depressed center wheels, or sticks.

CALL YOUR CARBORUNDUM DISTRIBUTOR TODAY. He's your best bet for experienced counsel on the latest developments in the field. He carries complete stocks for prompt service. You'll find him listed under "Abrasives" in the yellow pages.

This "tell-all" booklet is FREE!

THE CARBORUNDUM COMPANY, Dept. AM-81-37
Niagara Falls, New York

YES! I'd like a copy of "MX Products"—Booklet No. 3.

NAME _____ TITLE _____

COMPANY _____

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RUNDUM

MARK

the ONLY source for EVERY abrasive product you need

NEW

MULTIPLE O.D.
STEP TURNINGS

Turning 90° shoulders in the direction of the feed, or blending a shoulder with a radius, is possible on either I.D. or O.D. turning.

MAKES *precision duplicating* PRACTICAL and PROFITABLE

in any machine shop . . .

Use it for PROFITS—
Use it for CONVENIENCE

Now any machine shop that has an engine lathe can turn out precision duplicating at low cost. No longer need orders for identical duplicates be farmed out or refused.

This completely *new* profile tracing attachment is rugged, compact and thoroughly shop-proved. Its extremely simple design makes it foolproof and trouble-free. Its versatility adapts it to many different applications and it will satisfactorily perform most of the operations of high-cost, complicated duplicating equipment.

INSTALLED IN FIVE MINUTES

Installation or removal requires only a few minutes. No alterations to the lathe are necessary. Once set up, a lathe equipped with PRO-TRACER can be operated by semi-skilled labor. One operator can run a battery of them.

- **PRECISION BUILT** — *tolerances as close as .0005 have been held.*
- **INSTANT TOOL RETRACTION** — *pre-loaded ball bearings also eliminate play and back lash.*
- **WORK SIZE** — *limited only by length of lathe.*
- **TEMPLATES** — *easily and inexpensively made from standard ground stock 1/8"x2".*
- **SHORT OR LONG RUNS** — *rugged enough for three-shift production. Ideal for runs too short for long-run equipment.*

Write for fully descriptive folder.

only $375 complete

IN STURDY CARRY CASE FOR COMPACT STORAGE

AIR CONTROL DIVISION OF
Lehigh FOUNDRIES, INC.
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Manufacturers of a complete line of
AIR VALVES • CYLINDERS • HOISTS
Precision Castings • Automatic Vending Machines
Commercial Refrigeration Systems and Units
Profile Tracing Lathe Attachments

QUICKLY SET UP FOR

MULTIPLE FACINGS

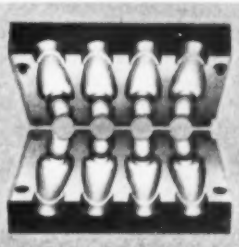
By turning Lehigh PRO-TRACER at right angles to spindle, it can be used for profile facing.

MULTIPLE O.D. TURNINGS

The Lehigh PRO-TRACER can be used for O.D. turning including tapers. It will make an .031 minimum radius and will turn an unlimited maximum radius.

MULTIPLE SHOULDER THREADINGS

Internal or external threadings, straight or tapered, can be made with Lehigh PRO-TRACER. Because of quick-retracting of cutting tool, thread can be cut close to a shoulder without danger of breaking tools.

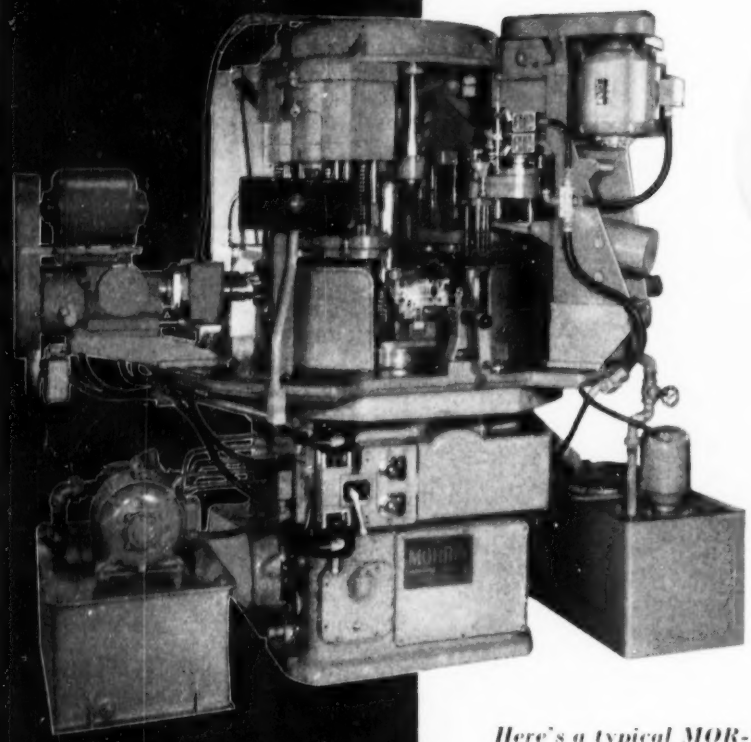


MULTIPLE BORINGS

Boring and I.D. contours can be turned with Lehigh PRO-TRACER by same method as conventional O.D. turning. A 90° step can be cut in the direction of the feed.

how little does it cost...

to get "special machine" production with combination standard units?



Producing 170 finished transmission control valve bodies per hour at 100% efficiency, this machine performs 32 drilling and tapping operations in two cycles.

Here's a typical MOR-SPEED answer to an ever-more important problem:

A combination of Morris standard units . . . center column, base, indexing mechanism and hydraulic units . . . plus a made-to-order vertical and auxiliary side heads . . . make up this high production machine. Cost is less, delivery faster . . . the user gets the accuracy and low cost production of a "special" without the usual sky-high costs and limited application of conventional units.

Consider the multiple savings . . . investment, labor, time and floor space . . . of MOR-SPEED multiple machining. Let Morris Engineers prove that high production *and* precision can be yours for less than you might imagine.

a better product at less cost with precision - plus production

Builders of MOR-SPEED Tools

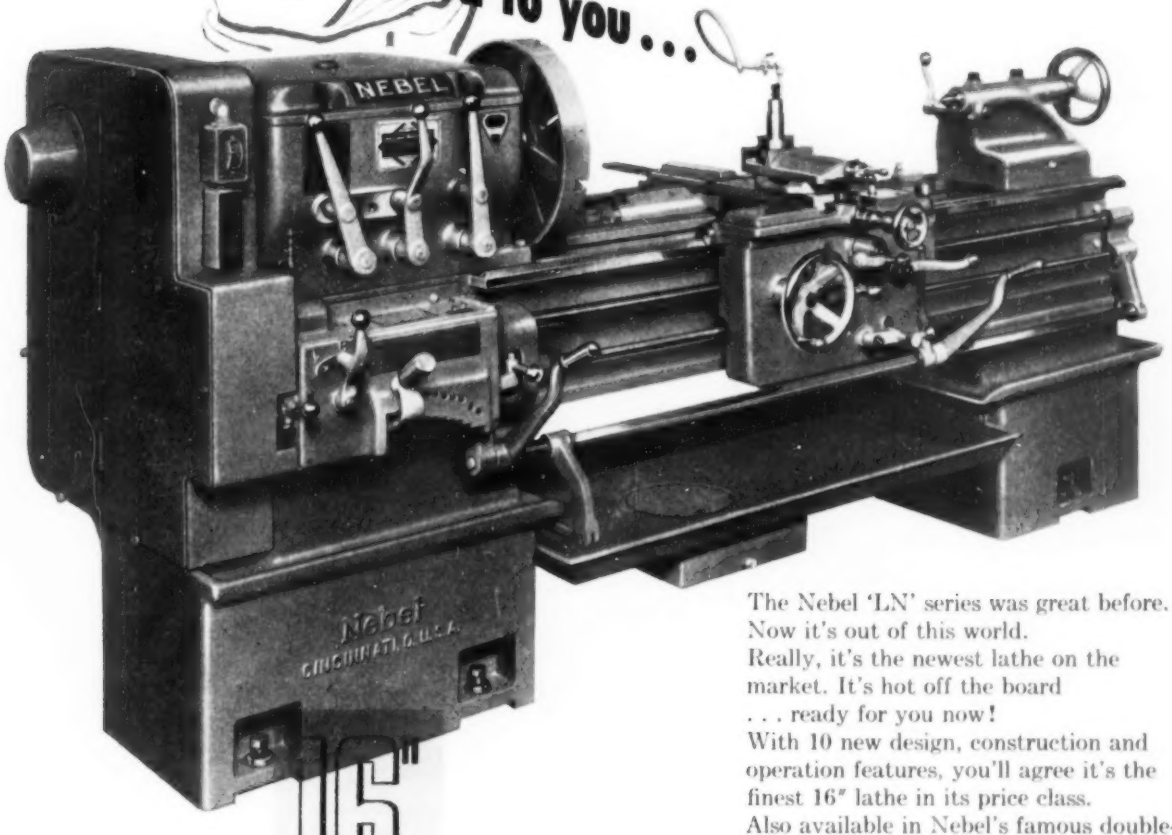
Morris

THE MORRIS MACHINE TOOL CO.

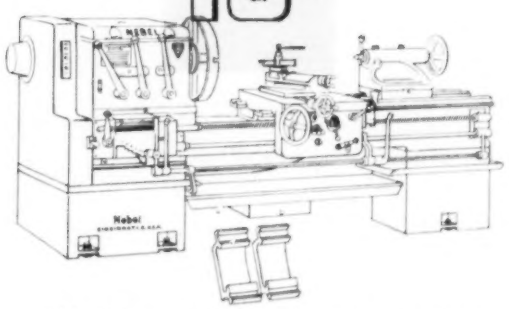
933 HARRIET ST., CINCINNATI 3, OHIO

right off the board to you...

THE NEBEL 16" MODIFIED 'LN' SERIES MEDIUM DUTY LATHE



16"



Wide, deep gap presents additional swing capacity . . . has all the advantages of the 16" Modified 'LN' engine lathe.

The Nebel 'LN' series was great before. Now it's out of this world. Really, it's the newest lathe on the market. It's hot off the board . . . ready for you now!

With 10 new design, construction and operation features, you'll agree it's the finest 16" lathe in its price class.

Also available in Nebel's famous double-duty removable block gap model.

For complete information, write The Nebel Machine Tool Co., Cincinnati 25, Ohio.

Nebel

Workhorse of the Metalworking Industry since 1899

Keep Your on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510. For Drills ¼ to 3". 2-3-4 flute.

OLIVER DIE MAKING MACHINES

Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15" — also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER

Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 11/2" wide x 13/4" high from 0 to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten-Carbide and high speed tools—offers increased production, lower tool costs and savings in man-hours. Extremely fine finish assured.

Write Today For Complete Information

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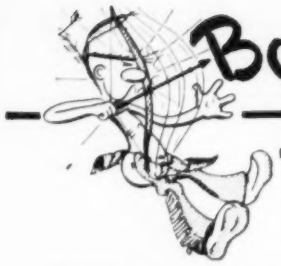


Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Contribution, Please

We are a fairly large company and our employees are being constantly asked for contributions to one thing or another. Every time someone gets married, or has a baby, gets a promotion, or leaves the company, gets sick, or dies, somebody starts a subscription list and takes up a collection for him or her.

It has reached the point where this happens almost every week, and a lot of the men are getting pretty sick of it. Yet they don't like to refuse for fear of being considered cheapskates, but there is little or no goodwill in their offering. Can anything be done to stop this annoying practice?

T A Campbell
Providence

The practice could be stopped by executive order but would probably continue sub rosa. Many companies operate a voluntary "Sunshine Fund" to which each employee contributes a fixed sum—usually a dime—each week. A committee administers the fund and buys a suitable gift when the occasion arises.—Ed.

What About Gifts?

A salesman recently visited our plant and, in my chief's absence, talked with me. I had no authority to make a purchase and, in any event, we did not at that time require any of his merchandise. A few days later, however, he sent me a present worth, I would guess, about $10 or $15.

My boss insisted that I return it because accepting it would place me under an obligation. I cannot see why, as I do not have the power to make a purchase, but he insists. The trouble is that I have drunk part of it, so now I shall have to go out and replace it and shall be out of pocket because, ordinarily, I could not afford to buy that class of goods.

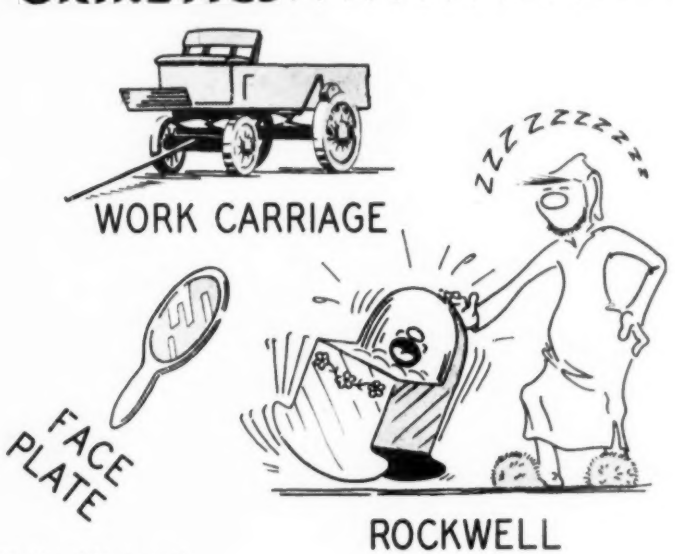
I suppose I shall have to obey if I want to keep my job, but do you think it is fair to penalize me this way?

A Mackinnon
Philadelphia

It is always a mistake to accept gifts from a salesman because, consciously or unconsciously, they do affect your decisions and place you under some obligation. At some future time, when you do have authority to make purchases, you could be prejudiced

GRINETICS

BY D G SMITH



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ease and economy

...with Super Service accuracy

● *Photo—Courtesy Aerojet—Division of The General Tire & Rubber Co.*

Working on rocket motors at Aerojet—Division of The General Tire & Rubber Company, this versatile 4′ 9″ column Cincinnati Bickford Super Service Radial is economically drilling and tapping in type 347 stainless steel.

Class 3 fit is required on the tapping operations of these ½″ x 20″ and 7/16″ x 24″ holes.

In this unusual installation a 12-foot pit permits processing of large work in vertical position, while another piece is set up on large V-block fixtures on plain box table.

The centralized controls clear view Bickford Head, and wide selection of speeds and feeds all bring ease and economy on this job.

Write for Booklet R-21-B.

CINCINNATI BICKFORD

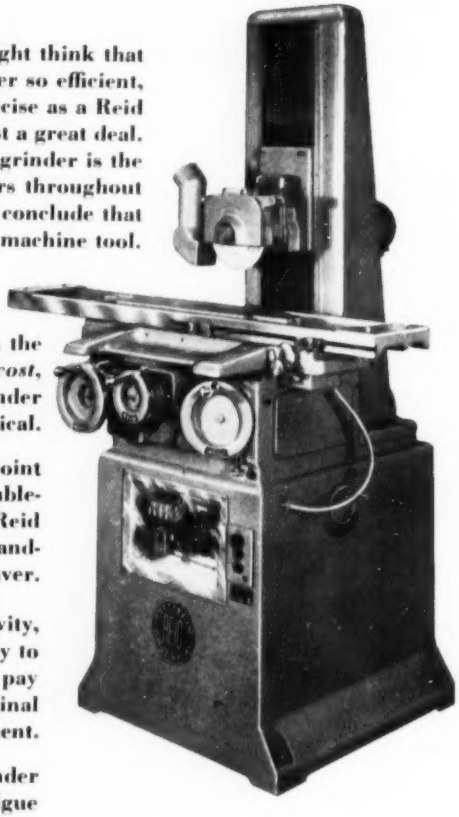
RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio U.S.A.

You SAVE with a REID Grinder

You might think that a grinder so efficient, labor-saving and precise as a Reid Grinder would cost a great deal. Because the Reid grinder is the preference of operators throughout industry, you might conclude that it is an expensive machine tool.



Actually, from the standpoint of *first cost*, the Reid grinder is economical.

From the standpoint of continued, trouble-free operation, the Reid grinder is an out-and-out money saver.

Its productivity, speed, and ability to improve work soon pay for the original investment.

Because the Reid grinder lessens operator fatigue and steps up production, it is a profitable tool.

and

. . . Reid's co-ordinated design, with its many proven *better* features, which anticipate future grinding needs, makes this masterpiece of machine tools a long-term, all-embracing economy to buy and operate.

Comparision will prove!

Write for bulletin 618-1.

Reid Brothers Company, Inc.

BEVERLY, MASSACHUSETTS

in the salesman's favor. It is unfortunate that you will be out of pocket, but that's part of the price of learning your job.—Ed.

Teachers' Troubles

After reading your articles on apprentice training, quality of labor, etc, I think it time to offer some sound reasons for gripes concerning labor and help in general. This is offered on the basis of several years of teaching experience in High and Vocational schools. Further, I hold a Pennsylvania State teaching certificate for machine shop practice, math, and chemistry, and have a shop background through journeyman to toolmaker. Here is the origin of poor help:

In every school I have been in, the maximum allowance per pupil, per term, is 9 cents for supplies for machine-shop practice. This means that if a teacher expects to have 100 pupils in a 5-month period, he can spend only $9.00 for all supplies. This includes files, drills, sheet metal, barstock, scales, calipers, hammers, solder, hacksaws and blades, taps, wrenches, and all the things necessary in a training course.

This money-credit may be used to purchase supplies through the school system only. Prices of all items are almost double the retail price. Thus a 30c file will be charged at 40c to 60c.

Gifts of supplies from the Federal Government or from Industry are forbidden. Millions of dollars worth of government surplus—auto parts, typewriters, machinery, tools, electrical stuff, etc—were flatly refused.

Experienced shop teachers are not wanted. Instead, the demand is for people with no technical knowledge, but capable of amusing the pupils with theory on paper, visits to plants, motion pictures, tons of catalogs, and now—proposed television. But no practical work.

I well remember that Big Brass who, at a meeting of shop teachers, flatly rejected requests for materials and, instead, held up an assortment of 2-page ads of commercial products, then asked the teachers, "How

much of this free educational material can you use?"

Teachers, on first starting, must sign a statement bearing the following clause: "Those found guilty of conduct unbecoming a teacher may be dismissed." Would a decent man remain voluntarily? This letter, and every protest against this moronic grade of training, constitutes such conduct.

I Joffe
Philadelphia

Rheumatic Hippo

Have just read John Homewood's letter (*AM*—June 8 '53, p116) in which he tells of repairing the spokes of a broken cast-iron gear by pouring molten iron around the break. He says the results looked like a rheumatic hippo, and I'm not surprised. The whole thing looks like very bad practice to me; in the first place the gear would be very badly out of balance, which is bad even at low speeds, and in the second place there is no guarantee that he had achieved a proper bond. The chances are that when the hot metal hit the cold spokes it congealed around them, but I doubt if it even began to melt the surface to make a proper weld.

The idea is not new; in fact it is often used, but if he had used Thermit the temperature would have been high enough to partly fuse the base metal and make a proper weld which could then have been chipped or ground off to bring the gear back into approximate balance.

J T Roberts
Detroit

Inside Out

You have a drawing of a hollow punch on your Practical Ideas pages (*AM*—Mar 16 '53, p181) submitted by Thomas Trail. The type of punch shown always leaves a ragged hole and the size is hard to predetermine. However, if the end is turned or taper reamed from the inside, it is comparatively easy to obtain a smooth, accurate hole.

Gordon Gleave
Stettler, Alta, Canada

FOR SPECIAL REAMERS . . . REMEMBER

GORHAM

They may not *look* alike, but all of the special tools on this page share a common function . . . *because every one is a reamer!* Each was engineered and manufactured by Gorham Tool Company to provide a practical solution to a specific production machining problem for one of our customers.

Actually, these reamers represent just a few of the many special-purpose cutting tools produced by Gorham. Others include milling cutters and end mills, inserted blade cutters, flat and circular form tools, profile cutters, and carbide tipped tools of every description. Gorham "specials" are turning problems into profits in thousands of plants every day . . . and the one we engineer for you will solve *your* next production machining problem, too! Take advantage of our experience.

Your nearby Gorham Field Engineer is a qualified cutting tool expert in both practical design and actual application, and his assistance is yours without obligation. Just write for his name, or send details of your problem direct to us. We'll have him get in touch with you promptly.

Gorham TOOL COMPANY

"EVERYTHING IN STANDARD AND SPECIAL CUTTING TOOLS"

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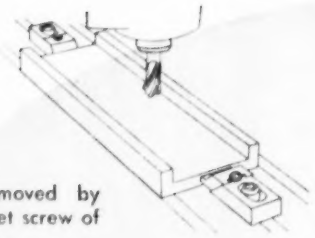
WEST COAST WAREHOUSE: 576 North Prairie Ave., Hawthorne, Calif.

HAVE YOU "WORK-HOLDING" PROBLEMS?

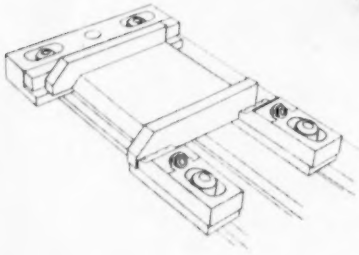
Eliminate U-Clamps, Straps and Fingers

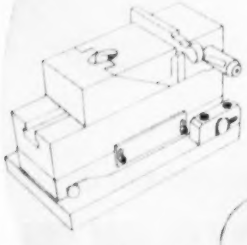
J & S *All-Purpose* JAW CLAMPS

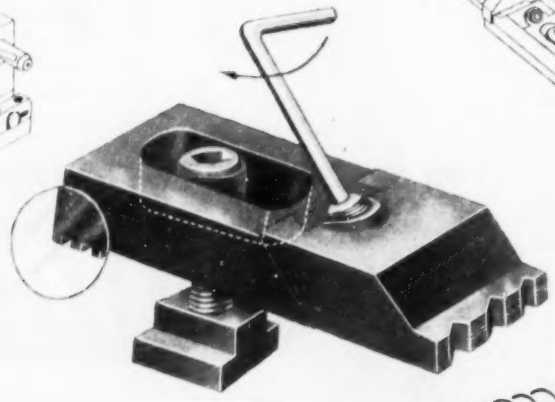
secure work-pieces quickly and rigidly
easily adapted to box fixtures



Work-piece removed by loosening one set screw of one clamp only.







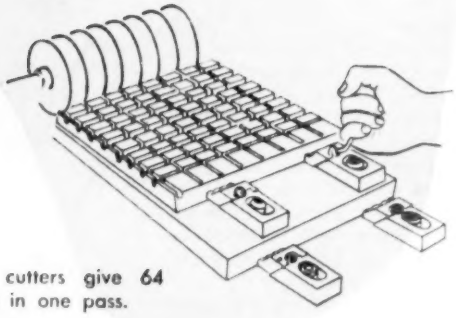
J & S Double Half Vise, for use on jig borers, millers, planers and shapers.

Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.

NEW METHOD OF SECURING WORK-PIECES TO MACHINE TOOLS

for Lathes, Planers, Milling Machines, Boring Millers, Jig Borers, etc. (9 different types including new Counter Clamp)

1. **Faster Set-up:** *One adjusting screw* provides a 5-ton force to *position* and *hold* the work-piece.
2. **Stronger Grip:** The *inward* and *downward* movement of the jaw clamp at a 45° angle gives a *single, powerful clamping action* — easily applied and controlled.
3. **Less Obstruction:** You can pass over the whole clamp 1" from the working surface of the machine face. *No interference with reading or measuring tools.*



Eight cutters give 64 pieces in one pass.

WRITE FOR NEW FOLDER ON 15 DIFFERENT TYPES AND SIZES!

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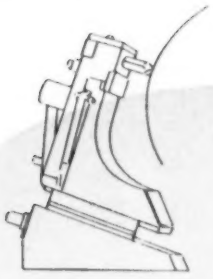
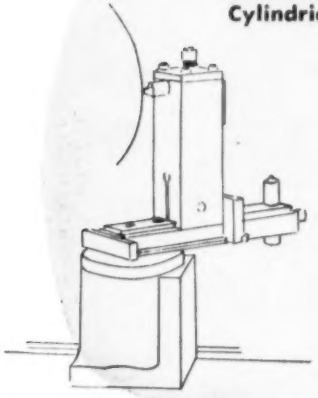
Fluidmotion

WHEEL DRESSERS

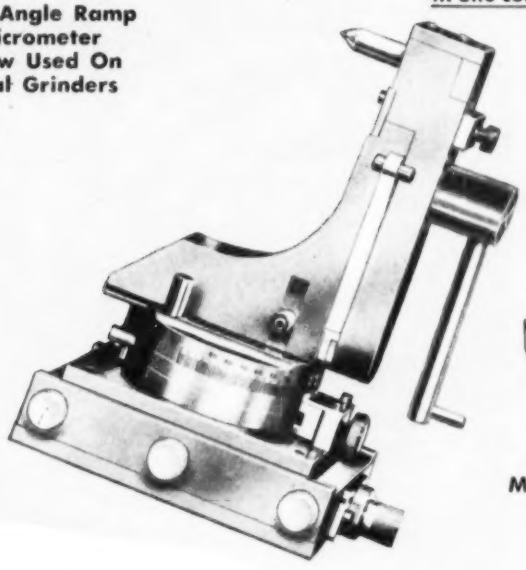
dress two angles tangent to a radius
in one continuous motion

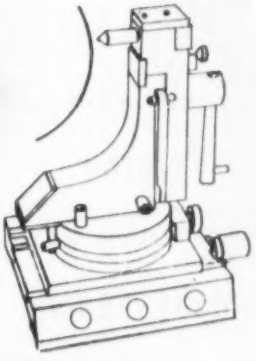


New Solid Angle Ramp
With Micrometer
Lead Screw Used On
Cylindrical Grinders



Form-master Low Cost Angle
Or Radius Dresser





Model "REC" on Surface
Grinders up to 14"
Diameter Wheels

ADAPTABLE TO ALL TYPES OF CYLINDRICAL AND SURFACE GRINDERS

With the "Fluidmotion" Dresser, you can *dress* two angles *tangent* to a radius—using one handle *in one continuous motion.* Operation is so fast and simple that beginners can use them to boost your grinding machine out-put. Forms are always clean, precise—angles and radii "flow" into each other. Contours are consistently sharp, accurate to .0001", without tool or chatter marks.

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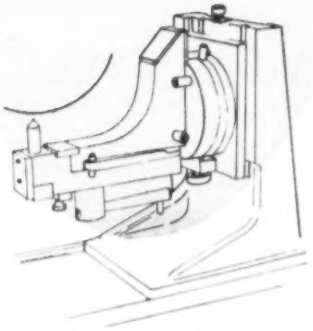


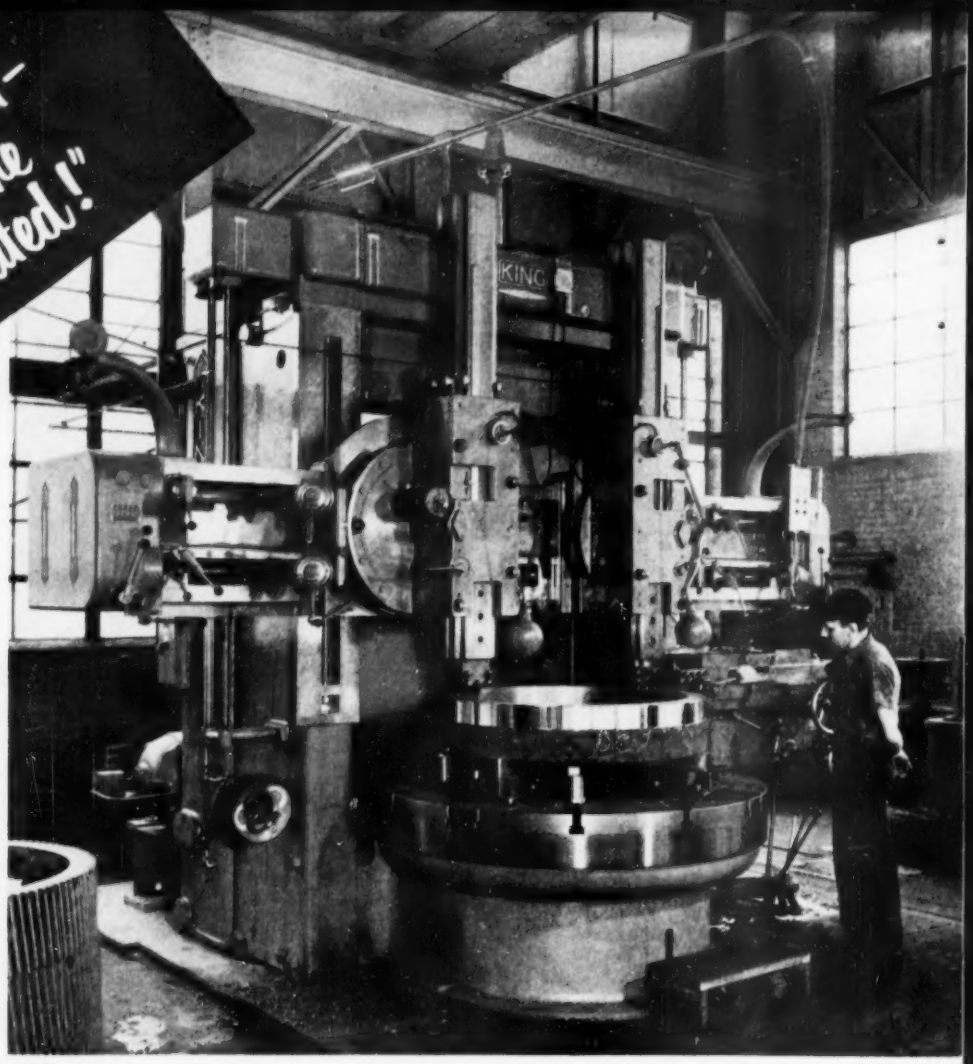
Under the wheel fixture with
micrometer feed for use on
surface grinders

J & S TOOL CO. INC.

A variety of models and attachments to suit your needs. Write for free catalog covering dressers in detail. J & S also manufactures a complete line of All-Purpose Jaw (machine) Clamps, Vises, and Special Tools. Write for Machine Shop "Time Savers" booklet.

"It's the most solid, smoothest-running machine I've ever operated!"

Says Veteran of Many Years on the Boring Mills at



THE TOOL STEEL GEAR & PINION CO. *(Cincinnati)*

The 72" boring mill pictured here is one of the many rugged, versatile KINGs with unmatched performance records at "Tool Steel." This particular KING is shown machining the inner diameter of a 50" O.D. ring gear—one of a wide range of jobs handled. At the controls is operator Arthur "Babe" Wilson. From long and diversified boring mill experience, Mr. Wilson knows the KING is really "king" in operating efficiency—and in the above quoted statement, he enthusiastically says so.

Massive proportions and extra-heavy construction give all KING machines the *rigidity* essential for fast, heavy work with consistent precision accuracy. Also, a wider feed and speed range plus simplified control make the KING adaptable for all types of boring, turning, and facing work—light or heavy, large or small.

KING machines are available in ten sizes, from 30" to 144", and in a variety of head combinations, with or without side head. For complete details, contact your local KING distributor—or write us direct.

Supreme
in Power, Speed, Accuracy . . .
SOLID RIGIDITY
KING
VERTICAL BORING & TURNING MACHINES

American Steel Foundries

KING MACHINE TOOL DIVISION

1150 TENNESSEE AVENUE CINCINNATI 29, OHIO

SPOT NEWS of Metalworking

- **Completely universal gear chamfering machine,** capable of handling practically any right or left hand helical or spur gear up to 6-in. diameter, will be on market shortly. Unit chamfers entire involute form of each gear tooth, including the root. Gear changeover requires only a few minutes and gears can be loaded and unloaded during production run with stopping machine.

- **Extra pay for machinists who carry their own precision instruments** from job to job as part of their trade is being demanded by the International Association of Machinists. The AFL union obtained a 5¢-per-hour "tool allowance" recently in a contract with 50 West Coast shipyards.

- **Arranging horizontal milling, drilling and boring machines around floor plate,** accurately leveled and mounted on precision jacks, has effected a 50% reduction in machining time on heavy components at a British plant. Rotating and traversing tables on machines carry the work between the machines and reduce the number of crane lifts from 16 to 3.

- **Orders for tools and dies are said to have been placed in Germany** by at least one midwestern company. Management has a resident representative in Germany "to ride herd" on these orders, according to reports.

Annual production rate of 50,000 machine tools by 1955 has been fixed in the East German Five-Year Plan. That is 2½ times recent volume. Larger-type machines, made heretofore mainly in West Germany, are to be stressed. Number of machine-tool building plants are to be reconstructed and expanded, including Niles Works in Chemnitz and East Berlin, and Wanderer in Chemnitz.

- **Kaiser Aluminum forging plant at Newark, Ohio, half finished, is to be converted** into a warehouse because of Air Force heavy press cutbacks. A 25,000-ton press, mostly completed when cancelled, is to be stored in the warehouse.

- **Illinois Tech reports all-time-high starting salaries for graduate engineers this June** — an average of $362 a month. This represents a jump of $20 over the February class average. Top salary average was offered architectural graduates — $399; second best offers went to mechanical engineers — $377. Others: electrical engineers, $371; industrial, $370.

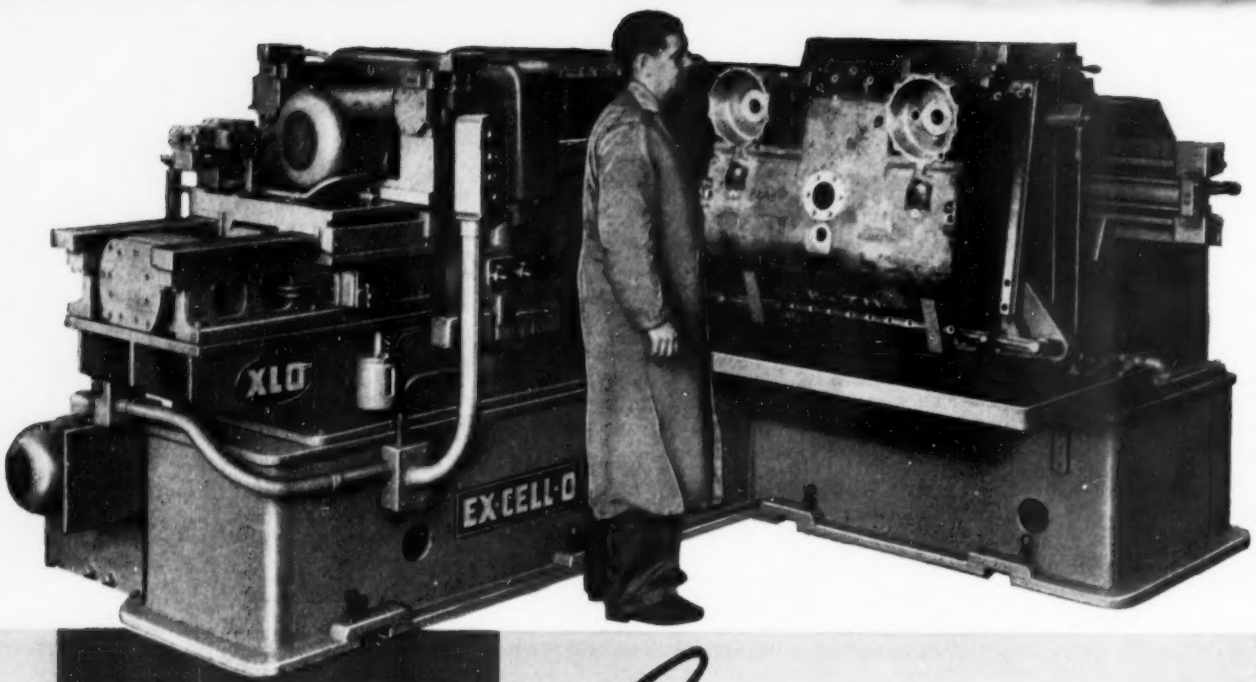
- **Largest induction heating installation anywhere** is going into US Hoffman's Scranton, Pa, division. It will be used to feed 14 forge-heating stations for 8-in and 155-mm shell. It employs four 1250 kw high-frequency motor-generators in parallel.

- **Fewer supervisors would be exempt from Taft-Hartley,** and thus eligible for inclusion in union bargaining units, if an amendment being pushed by the Engineers and Scientists of America, an independent union combine, goes through. Bill S 2443 is being introduced by Senator Humphrey of Minn.

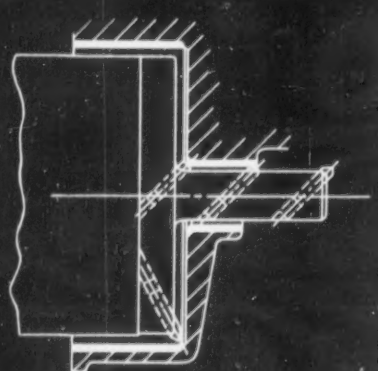
Airless spray painting can now be achieved by heating paints and lacquers to high temperatures and pressures in a closed circuit system and releasing them through a special gun. Over-spray is said to be virtually eliminated, booths are unnecessary and there is no blow-back of paint into the operator's face. In-plant tests indicate up to 50% more parts can be coated per gallon of paint. (See p164).

- **47 miles of electric cable are being installed at Brussels to supply power to 3000 machine** tools in 750 stands of the Third European Machine Tool Show to be held September 4-13. Cables are placed in the ground before pouring the concrete flooring.

- **Flank clearance angles on single-point turning tools are being increased** from the usual 7° to 12° in several big midwestern plants. Tool life may be up 3 to 4 times. Theory is that surface compresses at tool tip, then springs back and causes flank rubbing and tool wear if clearance is too small.



Fixture on this Ex-Cell-O Special Precision Boring Machine indexes between the loading position (shown) and the boring position.



This sketch shows one of the boring heads with tools, and the workpiece with machined surfaces indicated by heavy lines.

Another UNUSUAL PART BORED WITH AN EX-CELL-O *Precision Machine*

The tank transmission housing shown here is cast aluminum, roughly 40" long, 34" wide, 14" deep. Two areas, side-by-side, require identical operations: (1) rough and finish-bore a hole 1¾" in diameter, and (2) finish-bore a 9¼" diameter, 3½" deep. Limits of small bore are plus-or-minus .0005", with finish free from tool drag back lines.

EX-CELL-O MACHINES ARE PUTTING PRECISION INTO MANY BIG PARTS: cylinder blocks and heads, aircraft crankcases and accessory drive cases, heavy forgings for guns and tanks. For suggestions on machining your parts—large or small—call your Ex-Cell-O representative or write, wire or phone Ex-Cell-O in Detroit today.

53-2

XLO
EX-CELL-O for PRECISION

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS
DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

Washington

The Senate Appropriations Committee's rider to the Defense Department budget would halt preference for manufacturers located in "surplus" labor areas for awards of military contracts.

Special treatment has been accorded such defense contractors under an ODM manpower policy regulation pushed through by labor unions. Contractors in regions hard hit by unemployment—particularly New England—have been permitted to re-bid and meet average sales prices after all original national bids have been submitted. If they do, and there are still goods to be bought under a defense order, they're awarded contracts.

The Senate rider says that military contracts can't be awarded for purposes of "correcting or preventing economic dislocations." Supporters of the rider—Southern Congressmen in the main—say the defense program shouldn't be turned into a wholesale WPA. Opponents point out that Eisenhower pledged—in an election campaign talk in Lawrence, Mass—that he'd retain the policy of putting defense contracts into distressed areas.

• • •

Applications for fast tax writeoffs are still flowing into ODM. They average between 75 and 90 a week. During the peak post-Korea period, the now-defunct DPA was receiving about 200 weekly. ODM now approves about 60% of requests.

Most favorably treated are industries less than 50% from the government's defense expansion goals. These are producers of: heat-treating facilities for aluminum sheet, steel castings, heavy gray iron castings, heavy aluminum aircraft forgings, inland waterway and ocean-going ore vessels, tapered aluminum sheet, and hydraulic turbines.

• • •

Attorney General Brownell's request that the Federal Court cancel Alcan's 600,000-ton aluminum pig sale to Alcoa has bolstered the prospects of potential primary producers Olin and Wheland, whose plans to become new domestic producers were just about killed.

Now, ODM is thinking favorably about government loan guarantees for Olin and Wheland, something the two companies say they need to start operations and which ODM has previously refused to grant.

• • •

Air Force proponents are bitterly fighting back at cuts made in their budget. They charge that the basis for the cuts was not because air power goals were set too high, as Wilson claims, but really a subversion of air programs by Navy brass who are still burning from the drubbing they took in Congress during the 1949 inter-service battle.

That's why former Air Secretary, now Senator, W Stuart Symington (D-Mo.) and others keep referring to Assistant Secretary of Defense W J McNeil- -top Pentagon budget man—as "Admiral McNeil." He held a wartime appointment as admiral in the Navy's Bureau of Supplies and Accounts.

Lyle Garlock, McNeil's assistant and deputy comptroller, is coming in for his share of knocks too. He also was a Navy officer during WW II. And Pentagon General Counsel H Struve Hensel was one-time general counsel for the Navy. These are the facts that the Air Force cites to prove that the Pentagon is being taken over by a Navy clique.

Trouble is, though, the Air Force fight is beginning to backfire. Congress is now getting sour on the press agentry and may take a sweeping look at the Air Force's procurement, public information program, and top-heavy rank structure. There's already a charge that the airmen have too many colonels and lieutenant colonels in proportion to total strength.

• • •

Defense Secretary Wilson's figuring on dropping draft calls by some 5-8000 per month if a full Korean truce is negotiated is based on a total military manpower reduction. He figures that military strength in a non-shooting war, but with occupation forces in Korea, should be around 3.2 million instead of the present 3.5-plus million now in uniform. Plan is to drop to 3,358,000 by next June anyway. But without a shooting war a lot of men leaving the service would simply not be replaced. If we didn't need to keep a Korean garrison, total strength might be reduced to 3 million, according to Wilson aides.

• • •

More fringe wage benefits may be taxed as employee income. Pensions are subject to tax, but not the cost of such benefits as free lunches, medical service, employee discounts and the like.

Treasury Dept research staff is taking a good look at these benefits and may come up with some suggestions next year. Primary objective is to clarify and simplify tax rules covering them. But consideration also is being given to taxing the benefits now that they are widespread.

Internal Revenue Bureau tossed a bombshell into the United Mine Workers' Welfare Fund when it ruled the fund's income of $700,000 a year was not tax exempt. Reason: Fund fails to qualify as a pension trust because money is not earmarked specifically enough.

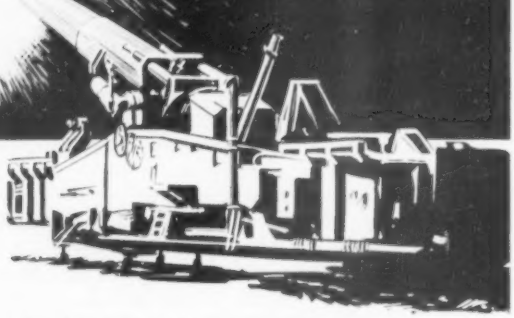
Microhoning

REDUCES COST

SIMPLIFIES PROCESSING

IMPROVES ACCURACY...

of 280 mm atomic gun barrel



Chosen over other methods, the Microhoning process is being used to generate the inside surface of the new 280 mm atomic gun barrel!

Microhoning . . . corrects all inaccuracies left by previous operations and generates a round, straight bore . . . eliminates several processing operations formerly required to obtain the necessary accuracy . . . facilitates broaching of the rifling by providing a true piloting diameter . . . assures a superior seal between the barrel and the projectile.

Constant improvement in this application has produced a Microhoning tool with a gage built into its nose, simplifying diameter checking and cutting 4/5 off the former Microhoning time!

This is another example of how Micromatic is continually developing new and better equipment for Microhoning all types of surfaces regardless of length, diameter, or material.

NEW MICROMATIC TOOL CUTS MICROHONING TIME BY 80%

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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Pendleton, Indiana

Detroit

The first change-over for 1954 is taking place. Hudson has gone down to rearrange its assembly lines for its larger series. The Jet job, however, has been continuing at the curtailed pace.

An estimated 5000 men are expected to be idled during the change-over, which may run a month.

The way it looks, is that Hudson will be among the first to announce new models. Chrysler had intended to be out early in the fall also, but the recent tool and die strike upset its schedules somewhat. That strike, incidentally, affected many more than Chrysler. General Motors divisions in particular were hard hit.

The tool and die strike settlement came in mid-July, meeting the economic terms demanded by the CIO Autoworkers, but loosening somewhat the tough conditions under which the shops have had to live the last few years.

The 7000-odd workers got a 15¢ raise across the board. Night shift premium was raised to 15¢ from 10¢. Where previously the shops paid only for the worker's Blue Cross insurance, now they will pay for half of whatever family insurance the worker wants beyond his own.

More notable, the shops got changes in the apprentice system. Apprentices may now be hired in a ratio of one per eight journeymen, rather than 15 as heretofore—something which will relieve the tightness in this direction over the long term. Also, a third class of apprentice is created—tool and die machinist, in addition to tool maker and die maker. This will make the situation more flexible.

• • •

Despite all the hullabaloo, cancellations of military contracts have not brought abont any substantial unemployment in Detroit or Michigan. The big Kaiser-Frazer layoff of about 10,000 people has been compensated by hirings of at least half of those workers.

Detroit's climb toward record employment totals, however, is fast slowing down. Probably the peak is being seen right now, or maybe a little bit behind us already. No change of consequence is expected during the summer months.

The skilled trade shortages are gradually being relieved, and it is expected that by the fourth quarter the intense pinch in that area will have been corrected.

Turnover, as is always the case when jobs are plentiful, has been high in Detroit. Manufacturing industry averages climbed from 11-per-thousand turnover a month (in January 1952) to 54-per-thousand in April 1953. Fabricated metal plants were even higher in April—64 per thousand. Other figures: Auto plants, 62; non-electrical machinery firms, 27.

Retooling is in prospect at auto lamp manufacturers. The Automobile Mfrs Assn has spearheaded a program for a new type of sealed beam headlamp which, when approved by state vehicle administrators, will become standard equipment. The new lamp increases light intensity and gives better visibility in fog or rain. It will be interchangeable with present sealed beam lamps.

Electrical appliance business may be off generally, but Detroit shops which are tooling room air conditioners report tremendous volume and interest in them. More and more companies are coming into that field, and developments ahead are varied and highly promising.

Tire companies, too, are building up tremendous sales records, and that is having some effect on their factory programs. The reason for it: Exceptionally high production of cars and trucks and—more important and more profitable—replacement sales for the bumper crop of 1950-51 automobiles and trucks.

• • •

Gemmer Mfg Co has developed a new type of linked power steering, a corollary to its integral type which initiated the power steering trend a few years back. Gemmer's device has now been completed by development. Production, however, will await orders for 1954 model installations—something the company has not yet obtained, but something on which prospects are deemed hopeful.

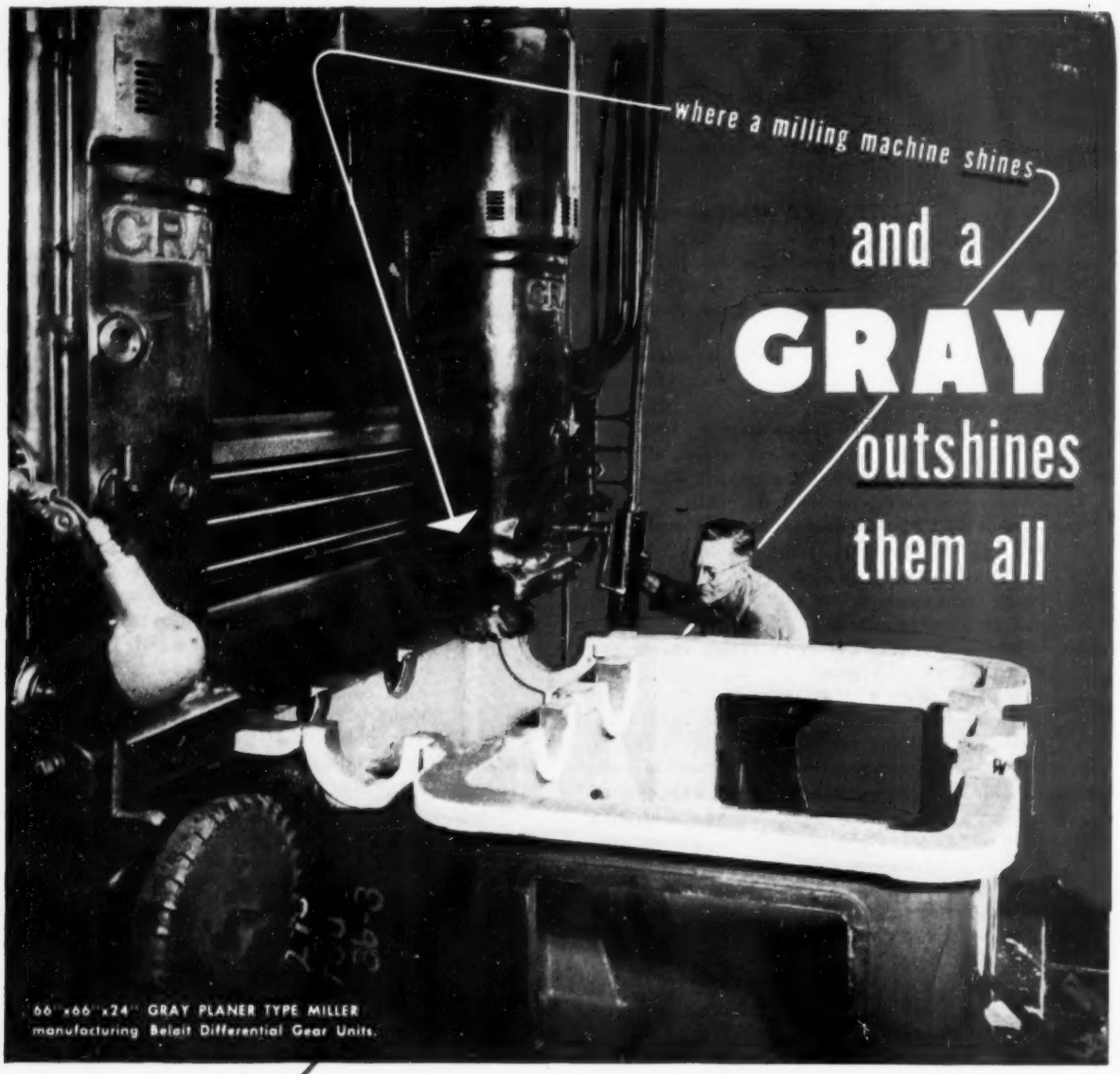
Power steering installations, said Ward's Reports, are building up like a snowball rolling downhill. During the first half of 1953 the service figured 410,000 such units were installed—double those for all 1952, despite being held down by limited facilities. Backlogs are big in spite of facilities doubling and tripling.

Today only Dodge, Hudson, Plymouth, and Willys do not offer power steering. They will before long. Installation rates, as reported by Ward's: Cadillac 95%; Olds 45%; Chrysler 43%; DeSoto 36%; Buick 30%. Pontiac's 12.7% is approximately the industry average.

• • •

"Can I Be a Craftsman?" That's a question in a lot of young minds, and that's the title of a new booklet put out for students and others by the educational relations section of General Motors Corp. It describes skilled classification jobs, tells about their virtues, gives details of apprentice training, and includes an aptitude questionnaire.

If automobile sales are any indication of the state of general business, the nation's softest spots are all west of the Mississippi—Denver, the San Francisco area, and the Pacific Northwest.



66" x66" x24" GRAY PLANER TYPE MILLER manufacturing Beloit Differential Gear Units.

When it comes to delivering HIGH-LOW COST PRODUCTION... GRAY PLANER TYPE MILLERS really shine in up-to-the-minute plants where only the finest precision work is acceptable.

here's why

- Compact GRAY Unit Heads make possible a wide variety of simultaneous high horsepower cuts. Each head has individual spindle motor.
- Speeds up to 1000 RPM are instantly obtained by the flick of a lever.
- Low Hung Drive to the spindle through a balanced planetary gear train with fly wheel inertia provides the ideal high horsepower carbide cutter drive.
- Efficient swivel or non-swivel design heads as desired.

a GRAY will shine in your plant when you see how it increases production — reduces time and costs.

DEPT. A

The G.A. GRAY Company

planers • milling planers
planer type milling machines
horizontal boring machines

CINCINNATI 7, OHIO, U. S. A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Machine Tools

New orders for machine tools added up to almost half a billion dollars the first half of 1953.

Shipments amounted to $639 million. Output now is at a rate of about $100 million a month, but it is doubtful whether it will hold there.

The NMTBA index shows that new orders in June were at 272, compared with 246 in May. Cancellations still are high, at 13.5% last month.

The ratio of foreign sales to the total, under 6%, stays exceptionally low on a historical basis.

• • •

Backlog for the machine tool industry is down to about seven months. It has been shrinking steadily since the Korean peak in September 1951 when it got up to 22 months.

Much of the new business in June came from automotive customers. Tooling for 1955 models is responsible.

Several builders have lost sales, because of long deliveries, to Swiss and German companies.

• • •

Army Ordnance has revealed details of what will be done with machine tools in plants to be deactivated. Some 1040 machines from Ford's tank plant at Livonia, Mich, will be stored in Quonset-type huts with concrete floors located about half a mile from the plant.

Maintenance crew and guards will add up to a total of 12 men to look after $35 million of machines. Ford will have the contract to maintain and guard the "package."

Breakdown of the Livonia equipment is roughly: Boring machines 30%; milling machines 20%; lathes 20%; grinders 10%; drilling machines 10%; miscellaneous 10%.

• • •

Wherever possible, equipment will be leased by Ordnance to the prime contractor or subcontractor.

Studebaker has some $1.5 million of machinery in its plant at South Bend. Most of it is assembly line equipment—paint booths, ovens, overhead conveyors, etc.

Studebaker probably will lease about $500,000 of this equipment. Yearly rental cost will be $24,000. Remainder of the equipment will be stored at charge of $19,000 a year. Lease may run for five years.

For further details on Army Ordnance plans, please turn to page 154.

• • •

A French steel company, with an offshore procurement contract for making shell for European delivery, is understood to have bought American-designed shell lathes to be built under license in France.

US dollars do not have to be used in this transaction. What's more, the cost per machine is less than for US-built lathes.

The American builder, foreseeing the difficulty of selling in Europe shell lathes manufactured here, made a special trip to France and concluded an agreement with a French company to have them made over there.

• • •

Britain's machine tool industry is to be partially nationalized if the Labor Party returns to power. Latest pronouncement of the Labor Party states that:

"**Labor will acquire in the public interest** a number of the key machine tool firms. These will act as centers of technical rationalization and expansion and will be closely integrated with the state-sponsored research organizations.

"**Labor will encourage the (machine tool) industry** to concentrate and expand both production and research. This can best be done under government control."

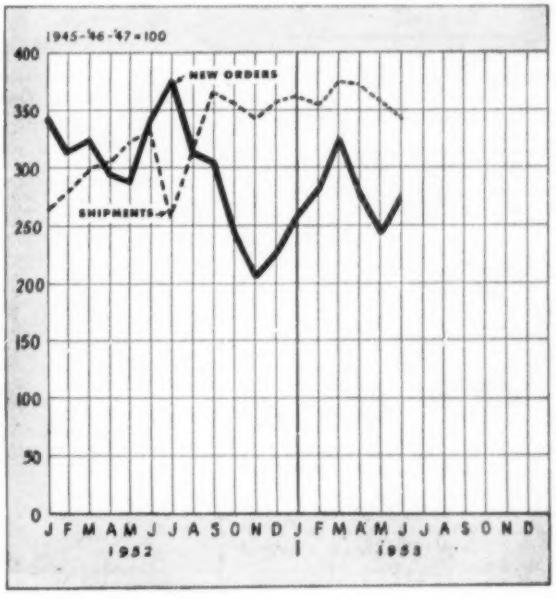
BF

MACHINE TOOL INDEX

(1945-47 = 100)

(Source: National Machine Tool Builders' Assn.)

June new orders reversed the two-month downtrend since the March peak by rising 25.6 points to slightly under the April level. June shipments, on the other hand, continued a three months' decline by dropping 28 points.



News About Created-Metals

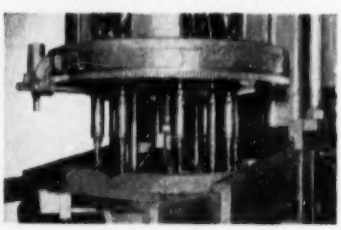
New "Brief-A-Log" Simplifies Ordering

A new condensed catalog and price list is being offered by the Carboloy Department of General Electric Company.

This "Brief-A-Log" (GT-265) incorporates Carboloy price reductions made June 22, and latest additions to the standard lines of tools and blanks.

Designed to simplify selecting and ordering, the Brief-A-Log is available free of charge. (Send coupon at right.)

Drill Cast Iron with Carbide Twist Drills



Drilling cast iron with carbide twist drills is definitely past the "maybe" stage. Users report doubled production, more than tripled drill life over H.S.S. drills, without any special drilling equipment or job engineering. Sound, how-to-do-it technical bulletins available free. Write Carboloy Department of General Electric Company. (See address at right.)

New Applications for Carbide Press Dies

Carboloy carbide dies are being profitably applied to blanking and piercing operations where production runs are high.

These dies are economical to use because they produce burr-free, close-tolerance work . . . outlast steel dies by 8 to 10 times.

Write for free Carboloy Die Engineering Manual D-124. (See address at right.)

YOUR CARBOLOY FIELD ENGINEER SAYS . . .

"Large, costly special

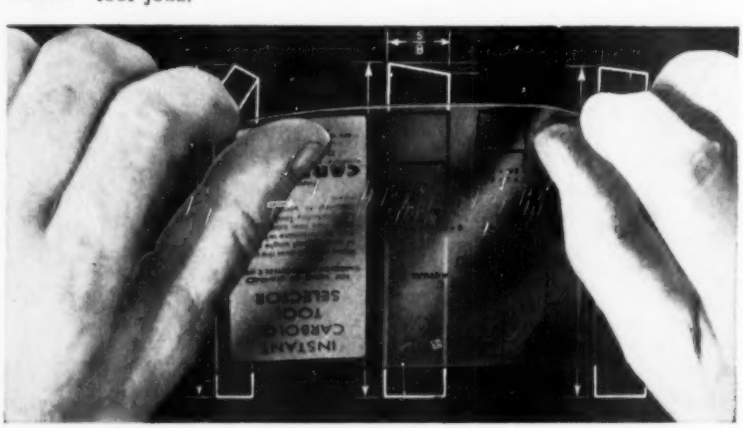
"Cut your special single-point tool stocks up to 30% with this simple-to-use MTI Plan

"The Minimum Tool Inventory Plan is based on the fact that the 11 Standard Carboloy Tools can be adapted to up to 80% of your special single-point jobs . . . thus eliminating many costly, made-to-print tools.

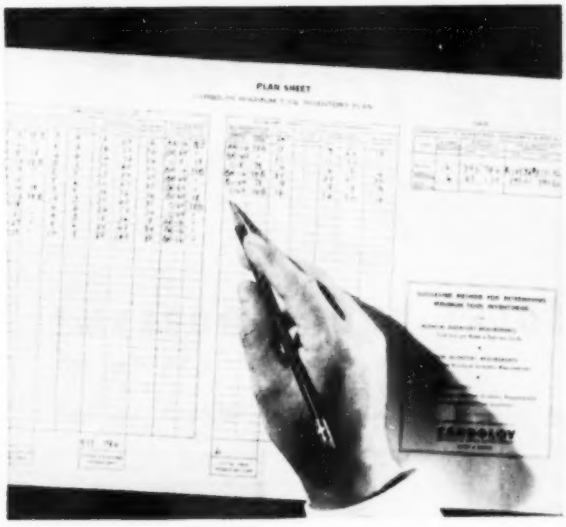
"The MTI Plan will show you which 'specials' can be eliminated, and exactly how much you'll save. With the 15% price reduction on Standard Carboloy Cemented Carbide Tools, in effect since June 22, now, more than ever before, it pays to standardize."

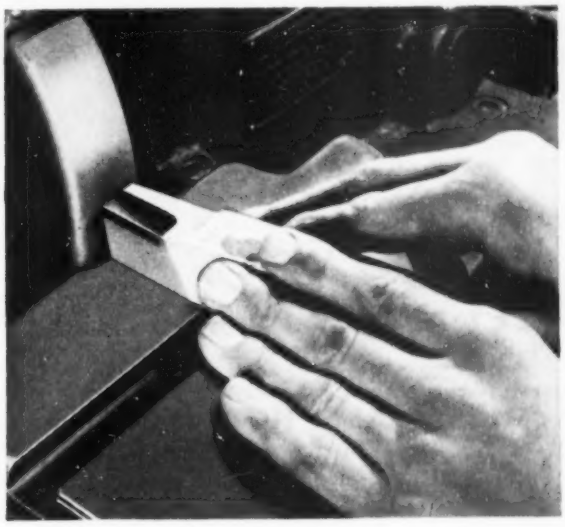
Send the coupon at right, attached to your company letterhead, for your free MTI Plan Kit. Then, determine your *own* benefits from the MTI Plan as follows:

1. **Using the Instant Tool Selectors,** you'll see at a glance how only 11 Standard Carboloy Tools can be easily and quickly adapted to handle 4 out of 5 of your special, made-to-print tool jobs.



inventories of tools now unnecessary"





2. **With the handy Plan Sheet provided,** you'll quickly get a dollars-and-cents answer showing how much you'll save by standardizing. Simple subtraction shows you how much your inventories can be cut by using standards.

3. **Order the Standard Tools** you'll need from your local Authorized Carboloy Distributor. Use them "as is," or quickly grind them to your specifications. Grinding hints, price lists and Standard Tool specifications are included in Kit.

AUTHORIZED CARBOLOY® CEMENTED CARBIDES DISTRIBUTORS

CARBOLOY TOOLS ARE STOCKED COAST TO COAST

Look under "Tools" in the Yellow Pages of your local telephone book or in Thomas' Register for your nearby Carboloy Distributor. He has complete local stocks and services. Ask him about the MTI Plan.

"Carboloy" is the registered trademark for the products of the Carboloy Department of General Electric Company.

Send coupon—pinned to your company letterhead—for your free MTI Plan Kit

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

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- ☐ Please rush me, at no cost or obligation, MTI Plan Kit
- ☐ Have your sales representative call to show me the Kit, without obligation
- ☐ Send me the new, free Brief-A-Log GT-265, containing complete specifications and prices of Standard Carboloy Tools and Blanks

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Company _____

Address _____

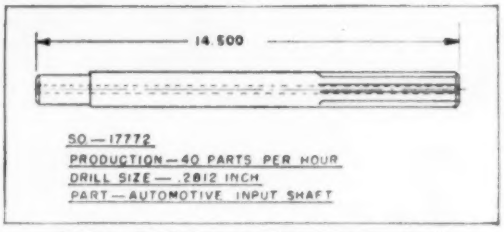
City _____ Zone _____ State _____

ARE YOU HAVING HOLE TROUBLE TOO?

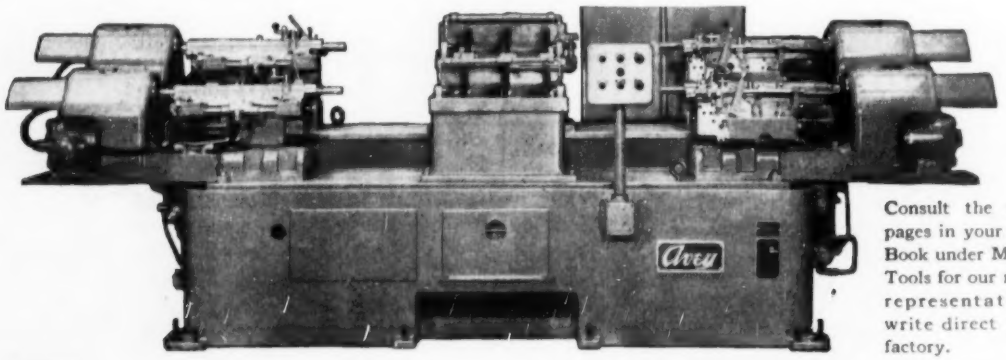
LET Avey ENGINEERS SOLVE YOUR PROBLEM!

HORIZONTAL DEEP HOLE DRILLING MACHINE

S. O. No. 17772 — Consists of four No. 1 *Avey-draulic* (hydraulic) Deep Hole Drilling Units mounted horizontally on a well-ribbed fabricated steel base. The Units having 12" ram travel were arranged in pairs to drill a $\frac{7}{32}$" diameter hole 14½" deep from both ends. An electrical interlock was provided to prevent drill interference. The coolant system and hydraulic power source were incorporated in the base. Machine as illustrated conformed to Automotive Standards. Write for literature.



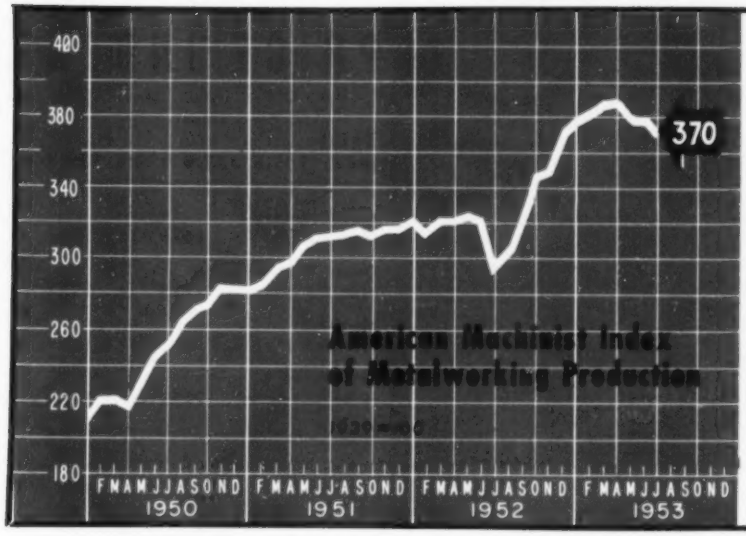
Fixtures—The fixtures were Vee Block type hand clamping to accommodate one part each.
Material—8641 Steel.



Consult the yellow pages in your Phone Book under Machine Tools for our nearest representative or write direct to the factory.

Avey DRILLING MACHINE CO.
CINCINNATI 1, OHIO

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JULY '53(*)	JUNE '53(p)	MAY '53(r)	JUNE '52
Tot. Index	**370**	**379**	**377**	**320**
Machinery	339	339	316	
Electrical Machinery	415	417	349	
Autos	329	321	228	
Other Transportation	602	596	538	
Other Metalworking	369	366	306	

(*) Estimated (p) preliminary (r) revised

Metalworking operations have been less affected by vacations than expected.

American Machinist Index puts July at 370, with 1939 taken as 100. That is only nine points below June.

August promises to be as good as July. And September will match or exceed August.

The index will be considerably influenced by what happens to automobile production. July's top performance by Detroit helped keep the index at an unprecedented midsummer peak.

Aviation activities, electrical machinery manufacture and armament output have bolstered metalworking lately.

• • •

Don't be fooled by all the reports about defense cutbacks. Most of the slashes have been in future rather than existing contracts.

Armament production will continue strong right up to the end of the year.

Main exception is in plane engines. Here current schedules have been pulled down by 25-50%.

• • •

Steel mills will go into the fourth quarter with satisfactory order books. But there will be a marked easing of the situation in sheets and strip by then.

Most sought after items today: plate, rounds in the over-two-inch class, sheet and strip.

• • •

Curtailment of new orders and holdup of shipments are reported by the stamping industry as coming from automotive customers. The drop from that source was 10% in June, same in July.

Similar caution is being shown by home appliance makers in ordering stampings.

Stamping plants have experienced a seasonal decline in sales. It began in May, continued in June, and was felt again during July.

Despite the falling off in business, stampers are not unduly worried. As more steel becomes available, some firms expect to get into production of new items on which engineering has already been done.

• • •

Gray iron casters say that their business is getting back onto a more normal basis. Customers are more conservative in placing orders. The cutback in military production also is responsible.

Malleable iron producers are in much the same position as gray iron people. Those serving automotive companies still have sizable order books. But otherwise sales are not what they were.

Bearing manufacturers selling to the automotive trade report releases still at a very high level. Business from other customers is holding up well, except from farm implement makers.

• • •

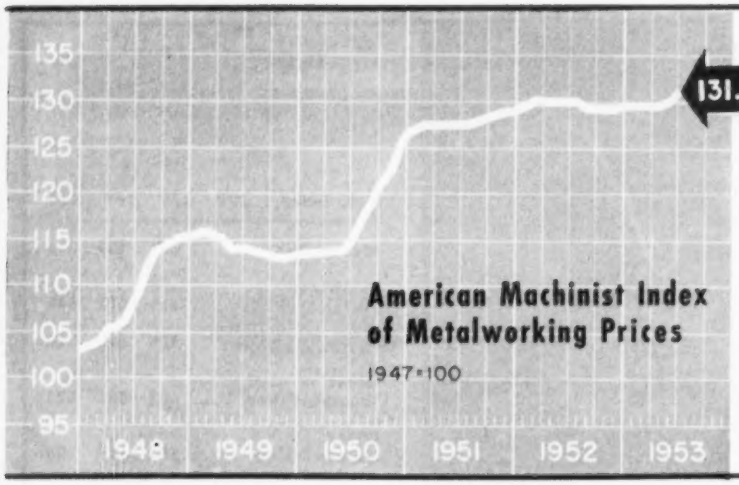
Agricultural equipment companies find that dealers' sales are on the slow side. Farmers are not rushing to buy as they were when they thought that the Korean war might cause curtailment of machinery output.

Farmers too don't have as much money to spend as they did. Many banks in farm areas are loaded with farm-equipment paper and are not inclined to grant much more credit.

Employment in metalworking plants round the country is not affected yet by the softening of sales.

Wherever men are let out, they are snapped up by other companies at high rates.

Gaging Business



PRICE INDEX

	JULY '53(*)	JUNE '53(p)	MAY '53(r)	JUNE '52
Total Index	**131.1**	**130.9**	**130.4**	**129.4**
Metalworking Machinery	**140.0**	**138.9**	**136.6**	
Other Machinery exc. Electrical	**134.9**	**134.3**	**132.2**	
Electrical Machinery	**129.1**	**127.6**	**124.9**	
Fabricated Metal Products	**127.8**	**127.6**	**127.8**	

(*) Estimated (p) preliminary (r) revised

The industrial price index, covering all commodities other than farm products and processed foods, advanced in June to its highest level since March 1952—113.8% of the 1947-49 average and 1% ahead of a year ago.

• • •

Employment soared upward in June from 62.7 million in May to 63.2 million. Reason: employment of students and graduates.

Some of this was also due to a marked upswing in agricultural employment.

Oddly enough, unemployment rose in June, too, when 250,000 more were jobless than in May.

• • •

First effects of a decline in business may be felt by the housing industry and its suppliers.

Housing starts have declined steadily since April, when 110,000 new homes were started. May's total was 107,000; June's was 103,000.

This reverses normal seasonal uptrend. But even so, the number of housing units started in the first six months of 1953 topped the total for the same period last year.

The pinch is being felt by housing suppliers—particularly the lumber, stone, clay and glass industries.

These industries have cut back production during the last few months to insure that building material stocks will not become too high in proportion to sales.

• • •

Cost of living hit a new high in June. The index is 114.5% of te 1947 figure and .2% above the previous high, in August and November 1952.

Food prices led the upswing. They rose 1.4% over the May index and practically erased all of the decline made earlier in the year.

• • •

All-business inventories increased $300 million in May to $77.9 billion at month's end. Gain is centered in manufacturing alone.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-1925 = 100)*	260.2	261.0	214.7
Steel ingot operation (thousands of tons)	2,183	2,134	317
Electric power output (million Kilowatt hours)	8,209	8,096	7,180
Production of automobiles and trucks	178,381	167,560	32,468
Engineering construction awards (*Eng. News-Record*—millions)	$253.4	$264.2	$278.2

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1935-1939 = 100)*	241	241	204
Index of durable manufactures production (1935-1939 = 100)*	319	320	247
Durable goods manufacturers' sales, millions*	$13,263	$13,490	$11,328
Electrical machinery manufacturers' sales, millions*	$ 1,380	$ 1,316	$ 1,069
Other machinery manufacturers' sales, millions*	$ 2,134	$ 2,224	$ 2,033
Durable goods manufacturers' new orders, millions	12,843	12,621	10,956
Electrical machinery manufacturers' new orders, millions	1,482	1,684	1,156
General machinery manufacturers' new orders, millions	2,033	2,202	1,713

* Seasonally adjusted

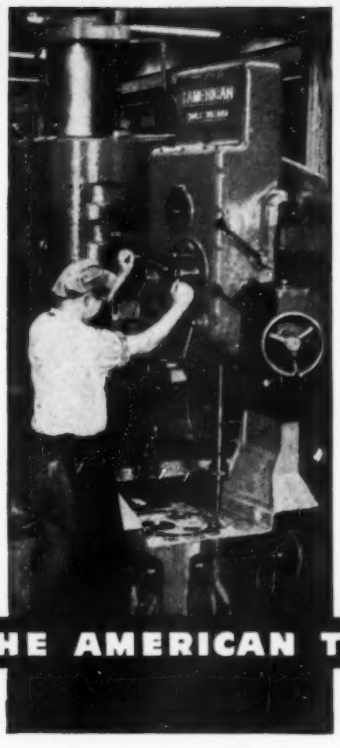
"CATERPILLAR"

+

"American"

A coalition of outstanding "name" products dedicated to the interests of industry.

Here is a "Caterpillar" Diesel DW20 Tractor with W20 Wagon loading heavy clay for the Garza-Little Elm Dam near Lewisville, Texas.



The astonishing ease of operation of these units due to their ultra-modern design makes the "load" lighter and the cost lower.

For the very same reason "Caterpillar" uses many "American" Radials. Because of their ultra-modern design they make the drilling, boring and tapping "load" lighter in "Caterpillar" plants and keep the cost of production at a minimum.

Extra power, centralized control, boring mill type spindle and extra fast tapping are outstanding virtues of "American" Hole Wizard Radials which swell the operator's pay envelope and help keep production on a profitable plane.

For more work, better work and lower cost work, get the facts about "AMERICAN".

Bulletin No. 327 upon request.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

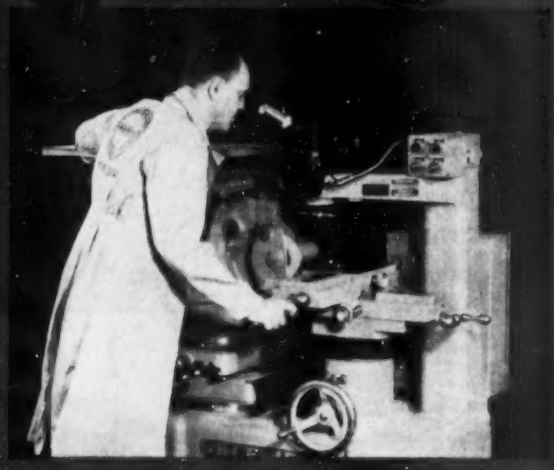
Grind High Precision Profiles Directly from the Drawing *with*

SHEFFIELD'S MICRO-FORM GRINDER

Features

- Grinds both flat and circular profiles
- No restrictions on profile intricacy
- No templates needed
- Perfect toolroom accuracy
- Saves up to 75% on profile work
- Final accuracy checked while work is still on the grinder
- Accuracy not affected by wheel wear
- No special wheel dressing required as wheel can be set at any angle—fewer wheels are needed
- Diamond impregnated wheels used in grinding carbides last longer—no wheels or no special dressing is required
- Multiple work parts ground simultaneously
- Grinds any material including carbides
- Controlled by 50x1 pantograph and 30 power scope and viewing screen

For full details and specifications, ask your Sheffield representative for Bulletin MPG-122-51 or write us direct.



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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Keep "Production Packages" Intact

Army Ordnance's ideas of what to do with its surplus production equipment deserve a round of applause and then a series of boos.

Best thing of all is the basic decision to try to keep intact the "production package" for a military component, such as an engine or transmission or gun. No tools are to be sold under any circumstances. In theory, they are to be retained close by the shut-down ordnance plant where they can be reassembled into a military production line with a minimum of delay.

The wide mobilization base advocated so ably by Mr Vance and his committee thus is to be preserved. There is to be no repetition of the hasty and helter-skelter demobilization that followed World War II. Here then, on paper, is the beginning of the practical application of the Vance Plan.

AT THIS POINT we strike a snag. Army Ordnance proposes to let the civilian contractor and his subcontractors, who would produce a military component again in an emergency, lease whatever machines they desire from the "production package."

We submit that this action in itself will have the effect of defeating Army Ordnance's laudable aims. If you once start to parcel out tools from "packages" here and there, allowing them to be installed in plants scattered over a considerable area, just how can tools be reassembled into production lines with the desired saving of time?

The leasing plan opens the way for government owned tools to be worn in use on civilian products. So, in case of emergency they would have to be rebuilt by the original machine tool builder, who then should be busy turning out new tools, or by a group of rebuilders with inadequate capacity to take on such a load. Grave delays thus would result.

There is another angle to the leasing idea. Why should a producer of civilian goods, just because he happens to be a defense contractor, have the competitive advantage of being able to lease rather than buy machine tools? Taxpayers thus are helping to provide part of his capital investment for him. Is that fair?

ARMY ORDNANCE'S holdings of machine tools should be looked upon as a national reserve, just as are the tools of other branches of the armed services. That national reserve should be kept in the best possible condition ready to be put to use instantly in an emergency. These tools are in the same defense category as guns or tanks or planes and should be treated as such.

The only safe and sane procedure then is to preserve the "production packages" as complete units put into mothballs to be taken out only in case of mobilization.

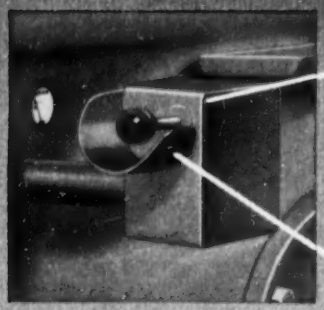
This is not alone *American Machinist's* opinion. It also is the view of influential men in the Pentagon. Despite Army Ordnance's action, the armed services are not committed bag and baggage to the leasing principle.

Before it is too late, we urge Army Ordnance to reconsider the leasing phase of its program. The program is so admirable in principle that it would be a shame to spoil it by retaining the leasing arrangement.

Burnham Finney

Outstanding ACCURACY

...and INSTANTANEOUS CONTROL effect a 30% saving!



The time required to shape 7 separate internal oil grooves in these steel sleeves was reduced from 11.5 minutes to 8. minutes, due to the Cincinnati Electro-Magnetic Clutch and Brake.

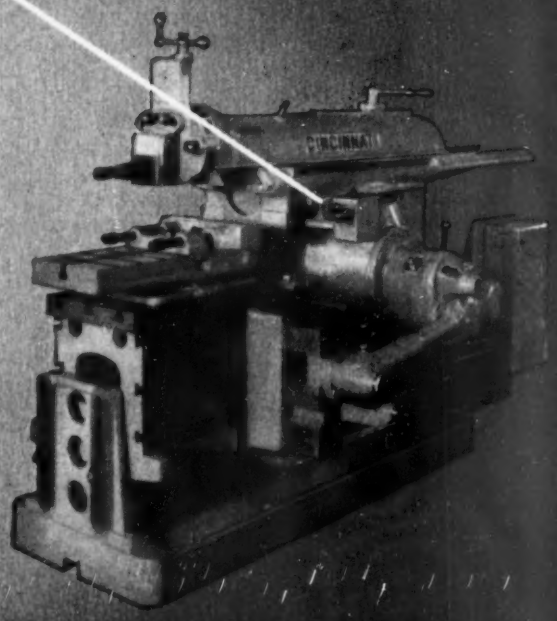
NEW CINCINNATI ELECTRO-MAGNETIC CLUTCH AND BRAKE. . . .

Where starts and stops are numerous they become a serious time waster!

The New Cincinnati Magnetic Clutch and Brake, with its single, convenient control lever, converts waste time into productive time. It gives the operator the fastest, simplest and most accurate control of his Shaper.

This powerful clutch and brake requires no shutdown for adjustment, and has a long, maintenance-free life, both time-saving and profitable features.

Write for Catalog N-5 for the complete line.



CINCINNATI

THE CINCINNATI SHAPER CO.

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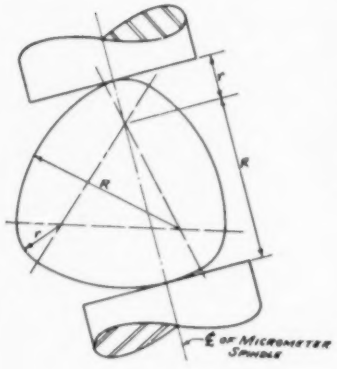
ODD MEASURING PROBLEMS

A good toolmaker passes along information to the apprentice; so the art of precision Metalworking grows through the years. Often much of this information is hard to find, particularly under one cover. Here we present a few ideas and theories, not necessarily related to each other, that are a definite part of the toolmaking and inspecting art

BY FRANK R ARCHIBALD

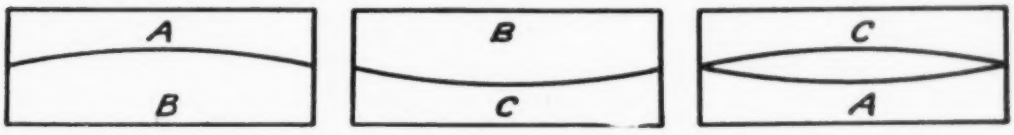


ROUND SHAFT

It is often assumed that you can check the roundness of a shaft by taking a series of micrometer readings around the OD; if all readings are the same, the shaft must be round. This is not necessarily true, as illustrated at left.

A shaft with three bulges, or six, may give uniform readings, but it may be a long way from round. This is sometimes a real problem in centerless grinding and in lapping plugs between plates. The same problem, in reverse, often comes up in drilling a hole through thin metal stock—the hole may turn out three-lobed, even though the drill is perfectly round. On an OD, almost any number of lobes can develop under certain conditions.

To beat this problem, you can check the OD of the stock with a V-block and dial indicator — to be doubly sure, check with two different V-blocks of different angles.



SURFACE PLATE

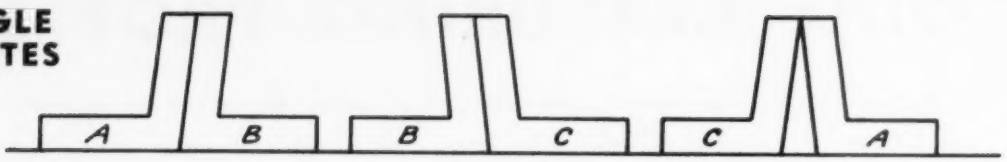
The method of developing a plane surface, such as a surface plate, is a fundamental process, but it is surprising how little is known of it in many quarters. The idea was generally credited to Sir Joseph Whitworth (see Roe, "English and American Tool Builders," Yale University Press), but its actual authorship is now uncertain.

Here's how it works: Three plates are made approximately flat by some ordinary process such as planing. They are marked "A", "B", and "C", and A is surfaced with a blueing dye and rubbed against B. Plate B shows high spots where the dye remains, and is scraped to bring these spots down. Repeated rubbing by plate A and scraping evens out the surface. Next B is coated with dye and rubbed against C, and the process continues. After C seems smooth, it is coated with dye and rubbed against A, and more scraping is done on A. The method continues until rubbing each plate against any of the other two shows no high spots.

There are only two kinds of surfaces that will contact each other in any position; the plane and the sphere. If any one of the plates is spherical, or if two are spherical, as in the first two sketches at right left, all three surfaces still will not match. Thus, when any of the three plates will show no high spots against any of the other plates, the three must all be plane.

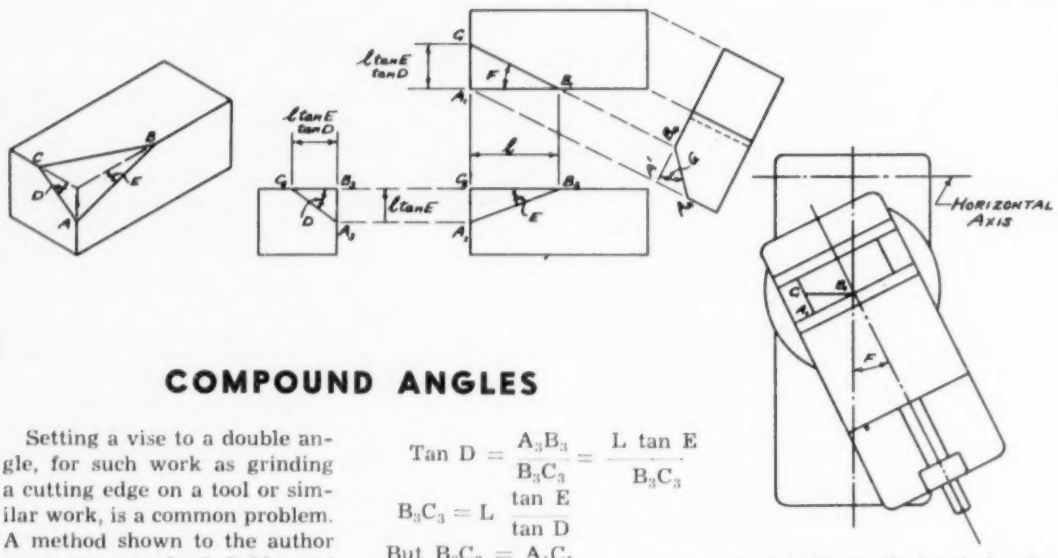
Optical flats are made by this method, in effect, although the light-refraction method of inspecting is much more accurate than dye transfer.

ANGLE PLATES



The same scheme can be applied to angle plates to insure that all are perfectly square, within the accuracy of the method. Three plates are marked "A", "B", and "C", and each is dyed and rubbed in turn against another plate until all three show no high spots—all this being done on a large flat table or surface plate. Comparison of "A" with "C," as above, magnifies any error.

COMPOUND ANGLES



Setting a vise to a double angle, for such work as grinding a cutting edge on a tool or similar work, is a common problem. A method shown to the author some years ago by L R Mayo of Brown & Sharpe is similar to many others, but seems to be fairly easy and straightforward:

The problem is to set a vise with axis like those in the sketch above so a block can be machined to produce the angles D and E at one corner. With a corner of the block clipped off as shown, you have a plane A B C, with point B a distance L back from the corner. Now:

$A_2C_2 = L \tan E = A_3B_3$

$$\text{Tan } D = \frac{A_3B_3}{B_3C_3} = \frac{L \tan E}{B_3C_3}$$

$$B_3C_3 = L \frac{\tan E}{\tan D}$$

But $B_3C_3 = A_1C_1$

$$\text{so } \tan F = \frac{A_1C_1}{A_1B_1} = \frac{L \tan E}{L} = \frac{\tan E}{\tan D}$$

Length $A^1A_4 = A_2C_2 = L \tan E$

$A^1B_4 = L \sin F$

$$\text{and } \tan G = \frac{A^1A_4}{A^1B_4} = \frac{L \tan E}{L \sin F}$$

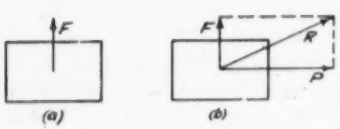
$$\text{Tan } G = \frac{\tan E}{\sin F}$$

also $\tan G_1 = \sqrt{\tan_2 D + \tan_2 E}$

To be practical, you place the block in the vise and rotate it around the vertical axis by the amount of angle F. Then you raise the vise through the angle G. Thus, line CB is parallel to the horizontal axis, and point A is on the same level as the other two points. A plain horizontal cut across the block produces the required surface at compound angles D and E.

Other vises may have different axis locations and arrangements, so somewhat different setups might be required.

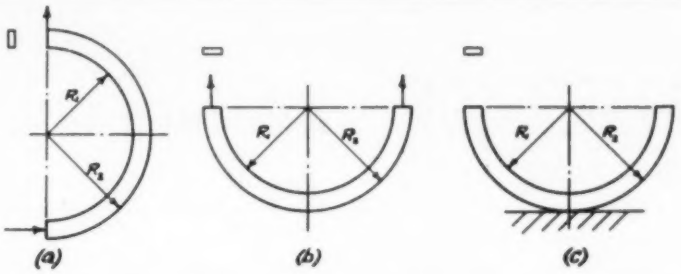
TIGHT PINS



It's a common experience to try pulling a pin, only to find that the sole way to get it out is add a twisting motion to the pull. The reason for this effect, not counting the force of friction and the aid of lubrication, is that the twisting force and pulling force add together to make a resultant force much higher than pulling force alone.

A force diagram explains the principle. The pulling force is F, and the twisting force is P, and both form resultant force R. The same effect is found when pushing a load along the floor. If the normal pushing force is not enough, you can add a side force to increase the resultant force, which will move the load.

U-FRAME DEFLECTION



Large micrometer frames and some few other large U-frames are also subject to weight deflection. The sketches above show three ways of supporting such a frame. If it is supported as at a, the deflection is given by:

$$Y = \frac{3\,\pi^2\,w\,(R_1+R_2)^4}{16\,E\,(R_2-R_1)^2}$$

where Y is the amount of jaw deflection (total for both jaws)
w is density of the material
R_1 is inside frame radius
R_2 is outside frame radius
E is modulus of elasticity of the material

If the frame is steel, for example, with R_1 15 in. and R_2 18 in., the deflection is about 0.0023 in.

When supported as at b, the deflection is:

$$Y = \frac{3\,\pi\,w\,(R_1+R_2)^3}{2E\,(R_2-R_1)^3}\left[\frac{3}{8}(R_2^2-R_1^2)(R_1+R_2) - \frac{1}{3}(R_2^3-R_1^3)\right]$$

For the same dimensions as above, the frame would close about 0.0008 in.

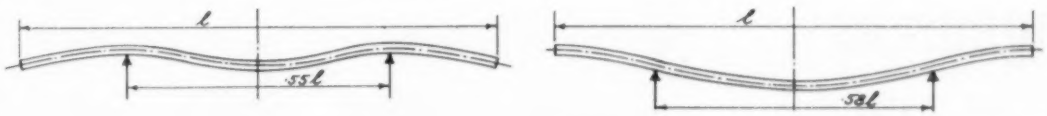
The support at c gives a deflection of:

$$Y = \frac{3\,\pi\,w\,(R_1+R_2)^3}{2\,E\,(R_2-R_1)^3}\left[\frac{1}{3}(R_2^3-R_1^3) - \frac{1}{8}(R_1+R_2)(R_2^2-R_1^2)\right]$$

which would also be about 0.0008 in.

Actually, a micrometer frame has a somewhat different shape and section than in these theoretical examples, but the deflections for the same dimensions are about the same.

SUPPORTING BEAMS



D	$Y_{SOLID\ BAR}$
1"	.001981"
1¼"	.001268"
1½"	.000881"

D	WALL	d	$Y_{HOLLOW\ BAR}$
1"	⅛"	¾"	.001268"
1¼"	⅛"	1"	.000773"
1½"	⅛"	1¼"	.000520"

Elasticity of materials causes considerable machine-shop trouble, particularly where a long part must be supported on a limited number of pedestals or trunnions. A bar of cast iron, for example, can be supported at each end, but it will sag as much as 0.0056 in. if it is 60 in. long, 6 in. wide, and 2½ in. thick. If the piece was planed under these support conditions, the total error in final thickness would be twice the deflection, 0.0112 in.

The support points for optimum conditions—where the deflection at each end is the same as at the middle—are separated by 55% of the length of the bar, centered under the bar. Here the deflections are only about 2% of those listed above.

There are calculations for this case, too. If:

y = central deflection, in.
w = density of material, lb/cu in.
A = cross-section area
L = length of bar
E = modulus of elasticity of material
I = moment of inertia of bar section

$$Y = \frac{5}{384}\,\frac{WAL^4}{EI}$$

$$Y = \frac{.0002669\ WAL^4}{EI}$$

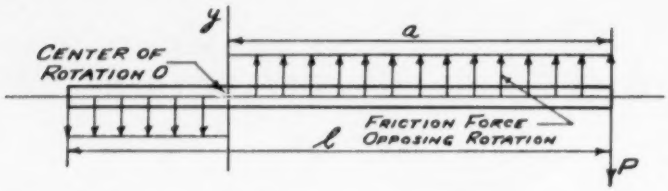
These results are important in supporting straightedges and standard length bars, for which they were developed.

To make the ends of the bar horizontal, the two supports must be separated by 58% of the bar length. These are called the "Airy Points," after Sir George Airy, a British astronomer. The British Imperial Yard, similar to the US standard length bars in Washington, is supported this way for length measurement.

Another deflection problem is where an alignment bar is held against a machine—supported at one end only. The deflection is:

$$Y = \frac{2wL^4}{ED^2}$$

where the symbols are as above, except that D is the diameter of the round bar. Examples of bar deflection for a bar of 18-in. length, solid or hollow, are given in the table above. Small d for hollow bars is the inner diameter.



STRAIGHTEDGE

A parallel bar or straightedge can be checked for straightness of its edge or side by laying it on a surface plate or similar surface, then pulling one end slowly in a direction perpendicular to the axis of the bar. This force will make the bar rotate about some point along the length of the bar; and the location of this point indicates whether or not the bar is straight. If the bar bears uniformly on the surface —that is, if it is straight —it will rotate about only one point. The point is found by calculation.

Let W be the weight of the bar, and μ the coefficient of friction.

$\Sigma Fy = 0 \qquad \Sigma Mo = 0$

$$P + \mu P\ (1-a) - \mu pa = 0$$

$$Pa - \mu p\ (1-a)\left(\frac{1-a}{2}\right) - \mu pa\ \frac{a}{2} = 0$$

$$a = \frac{1}{\sqrt{2}}, \quad P = (\sqrt{2}-1)\ \mu W$$

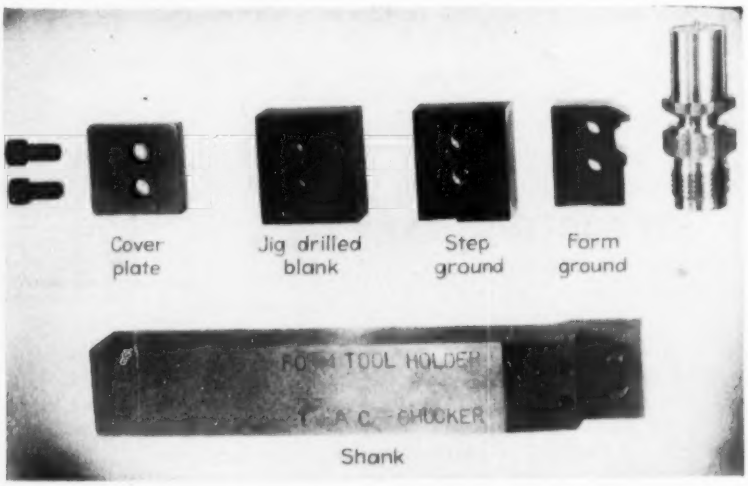
Thus the hinge point is at $\frac{1}{\sqrt{2}}$, which can be found from other calculations as well as the above method. The width of the plate has some effect on the position of the hinge point, but the calculating is much more difficult and probably not worth the effort.

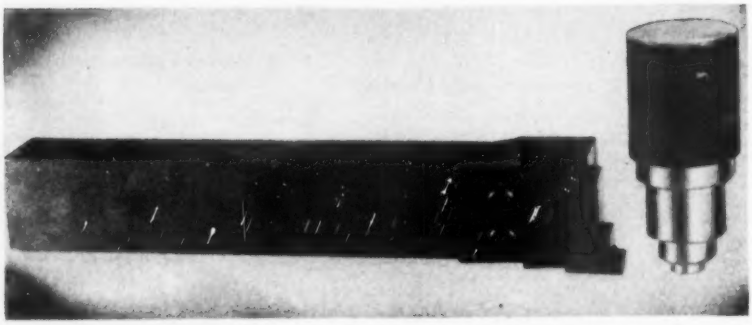
If the bar rotates about any other point, it is not straight.

Ingenious toolholder saves machine downtime

BY M MALONEY,
Toolroom Supervisor
WALTER KIDDE & COMPANY, INC.
BELLEVILLE, N. J.

HSS toolbits are changed in a few seconds on automatic bar and chucking machines without disturbing machine setup. Downtime is virtually eliminated and tool changes are made by operators





FORM-TOOL HOLDER has HSS tip located by two pins and clamped by plate and cap-screws. Bits can be replaced in a few seconds without disturbing machine setting

Quantity production of small fittings keeps several automatic bar and chucking machines busy at the Walter Kidde plant, Belleville, N J. On many of these HSS form tools are employed, and the problem of reducing downtime for changing tools has become serious. Conventional form tools, whether solid or with brazed tips, require considerable grinding time, and after each regrind the tool must be accurately positioned. This causes delays in production and takes up the time of the setup man.

To overcome this, I designed a simple, but highly effective, toolholder in which the tip is located by two pins and clamped by a cover plate and two capscrews. As soon as a tool becomes dull, the tip is removed and a fresh one placed over the pins and clamped down. The shank is not disturbed, so no machine adjustment is required and the machine can be back in operation in two minutes or less.

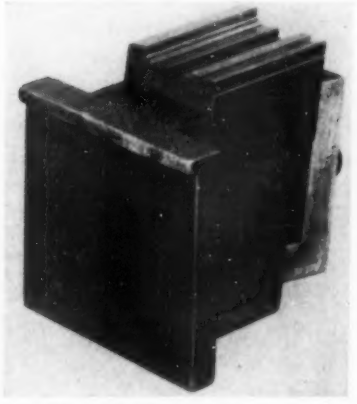
Old-style tools were made from 1½ × ¾-in. HSS, 7 in. long, and cost $10 each for the steel alone. Moreover, it was necessary to grind the shanks to 1 in. wide to fit the toolpost, and this brought the cost to $15. The new style blanks are cut from bar stock, ground on a Blanchard, drilled in a jig, heat treated, and the holes lightly honed, and the cost is only $2.

GRINDING TIME CUT

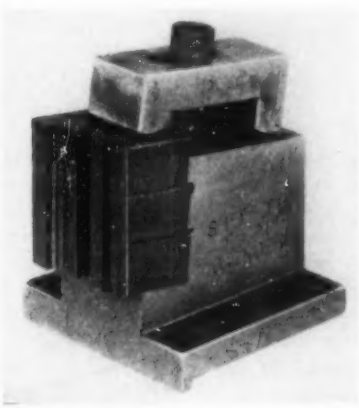
Both types are ground on a Sheffield Microform grinder, but the old type required 3 hr per tool, while the new are ground three at a time in 3 hr. First step in grinding is to load three blanks into a small fixture having an accurately ground base and rear face, the latter being inclined 8° from the vertical. The fixture is placed on its back on a magnetic chuck on a surface grinder and the cutting face of the bits is ground to produce the 8° clearance angle. The fixture is then transferred to the Microform and located by a lip on the base. An accurately made templet and the machine's optical system make it possible to produce an exact profile on any number of bits, singly or in groups of three.

Because all bits must be exactly alike to avoid resetting the machine, dull bits are not reground until a sufficient number have accumulated to justify regrinding and resetting the machine. Usually this does not occur until after the end of a run.

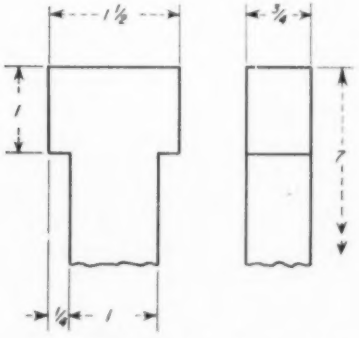
New style tools are being applied to automatic chuckers and to Warner & Swasey and Gisholt turret lathes, and are also to be used on Brown and Sharpe automatics.



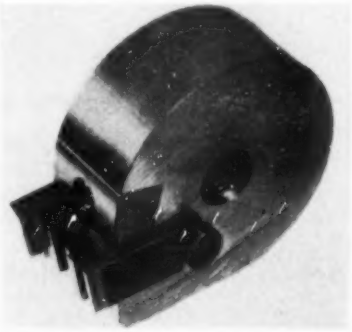
GRINDING FIXTURE holds three blanks, is placed on back on surface grinder to produce 8° clearance angle



PROFILE GRINDING is done on Sheffield Microform in same fixture. Lip on base insures exact positioning for all bits



CONVENTIONAL FORM TOOL made from solid HSS costs $15 before form grinding. New style bits cost only $2



CIRCULAR FORM TOOL employs same interchangeable principle. Collar at right acts as end locator for bit

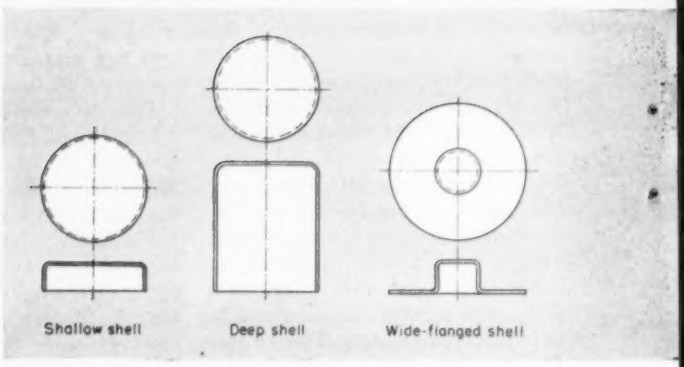
CIRCULAR FORM TOOLS

A further development of the principle has been its application to circular form tools. The same standard toolbit blank is employed, but pins are not used for location. Instead, a small collar is attached to one side of the holder to provide endwise location. Bits are locked into the holder by a wedge-shaped block pulled down by a single capscrew. As with the shank type, bits can be replaced without making any adjustment to the machine setting.

A further advantage of this tool is that by brazing carbide bits on standard manganese tool stock we are able to use both carbide and HSS tools in the same holder.

Considerable care must be taken in drilling the pin holes in the tool shank, and it is advisable to do this in the same jig used for drilling the tool blanks. It is important that the pins be a good snug fit in the tool tips and that the tip fits closely to the step on the holder so it cannot possibly move in any direction when cutting pressure is applied. If these simple precautions are observed, tools made in this manner will give excellent service and will save their cost many times over in a few weeks.

Cope Talks on Draw Dies...I



KNOW YOUR TERMINOLOGY FOR

To lead off an extensive series of articles taken from Acme's famous course on die engineering, Mr Cope explains the types of shells,

Power-press operations involved in the manufacture of drawn articles are second in breadth of application only to the cutting group of operations. Drawing presses produce cups, shells, pans and a multitude of objects which range from eyelets to automobile roof panels.

Before discussing the methods used in drawing operations, I should like to familiarize you with the different types of shells and the names of their component parts .The designer must understand these terms thoroughly in order to use the various rules and formulas necessary in computing the operations and in selecting the right dies. Different methods and procedures are used in drawing the various types of shells.

Drawn shells may be divided into eight general classes, Fig. 1:

1. Shallow
2. Deep
3. Wide flanged
4. Square and rectangular
5. Oval and spherical
6. Reverse, or inside-out
7. Taper and conical
8. Special

When the shell depth does not exceed three-quarters its diameter it is known as a shallow shell. When the depth of a shell is greater than three-quarters of its diameter it is known as a deep shell. Two or more drawing operations are required to produce a deep shell, whereas ordinary shells are usually made in one operation.

If a shell is drawn inside of another shell it is known as a reverse, or inside-out, shell. A one-piece angel-food pan is a good example.

A special shell is one in which the body is not concentric with other parts of the shell, or the flange at the open end is not parallel with the bottom; or the shell is made up of a combination of straight, tapered and spherical surfaces.

The names of the various parts of a shell are shown in Fig. 2.

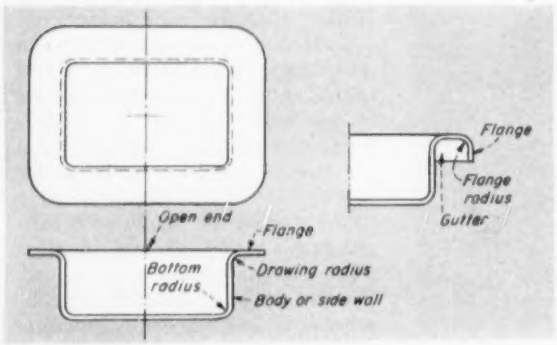


FIG. 2...Confusion is avoided by applying a standard terminology for the various parts of a drawn shell

PRINCIPLE OF DRAWING METAL

Flat blanks are drawn by confining them between a die and a pressure pad. Then, by means of a punch, the metal is forced to flow inward from between these two surfaces. The punch has the same shape as the hole in the die, but is smaller all around by an amount equal to one thickness of stock. This provides space for the metal in the shell wall.

The principle of drawing metal is clearly illustrated in the die shown in Figs. 3, 4 and 5. The die

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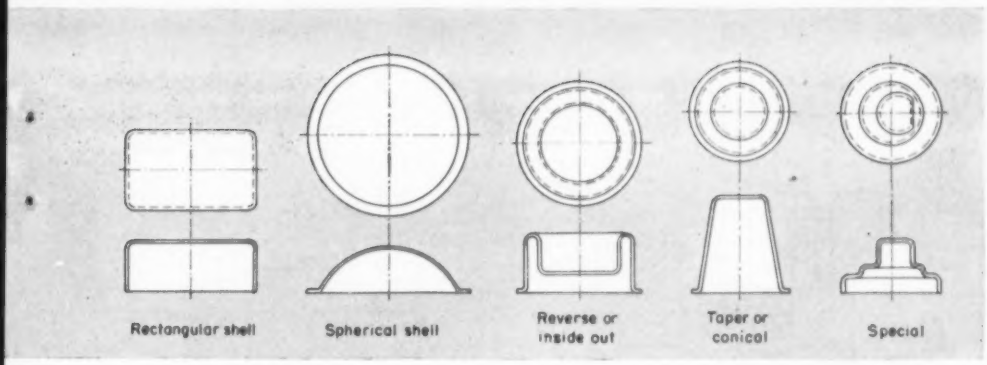


FIG. 1...There are eight basic types of shell. A special shell is one that combines the elements of the other types in varying degree and therefore cannot be classified with any of the other seven types

DRAWN SHELLS

BY STANLEY R COPE, President
ACME SCHOOL OF DIE DESIGN ENGINEERING

and differentiates between drawing and redrawing operations. Later on, he will give you many formulas and rules heretofore unpublished

consists of six main members, besides the die set and the pressure attachment. The latter is part of the press-room equipment. Referring to Fig. 3, the round, flat blank is shown at *A*, the pressure pad at *B*, pressure pins at *C*, die ring at *D*, punch at *E*, and the knockout plate and knockout rod at *F* and *G*, respectively.

The pressure attachment must be capable of exerting sufficient pressure against the blank to keep a constant space between the die ring and the pressure pad during the entire drawing operation. If insufficient pressure is supplied to the pad, the blank will become thicker in places, as it is drawn inward, causing it to wrinkle (Fig. 6). If wrinkles are allowed to form in the blank, the shell will not be smooth and may even break.

If you attempt to draw a large blank into a deep shell in one operation, the pressure required to perform the operation will exceed the ultimate strength of the metal. When this occurs the metal will be literally torn apart and cause the shell to fracture or break. The basic rule in computing drawing operations is to be certain that the pressure required to do any work is considerably less than the ultimate strength of the metal being drawn.

Deep shells are made by drawing them from flat blanks, first to a diameter as small as possible and then reducing the diameter of the shell and increasing its length in subsequent operations, until the correct diameter and length have been reached. The operation of reducing a shell to a smaller diameter is called reducing or, preferably, redrawing.

The diameter in which a shell can be redrawn at one time, or in one operation, is limited, because the ultimate strength of the metal must not be exceeded by the pressure required to redraw the shell. Deep shells can ordinarily be made with one drawing operation and one to three redrawing operations. If a shell is very small in diameter and very deep, additional redrawing operations may be necessary.

REDRAWING DIES

Several types of dies are used to redraw shells. The die shown in Figs. 7, 8 and 9 is one of the commonest types. This die consists of the same number of members as the drawing die previously described. Referring to Fig. 7, the shell is shown at *A*, the draw collar at *B*, pressure pins at *C*, die ring at *D*, punch at *E*, and the knockout plate and knockout rod at *F* and *G*, respectively.

The draw collar serves three purposes: (1) to locate the shell, (2) to prevent the sides of the shell from collapsing and subsequent wrinkling during the redrawing operation, and (3) to strip the finished shell from the punch.

ANNEALING BEFORE REDRAWING

A shell may be redrawn as many times as necessary to make it assume the correct diameter and length. However, if more than two redrawing operations are necessary, in addition to the first drawing operation, it may be necessary to anneal the shell between operations, in order to restore the metal to the original yield point before additional redrawing operations are performed.

METALS FOR DRAWING

Most pure metals, as well as their alloys, can be drawn into shells and other shapes, but the bulk of drawn stampings produced at present is made of steel, stainless steel, tinplate, aluminum, brass, cop-

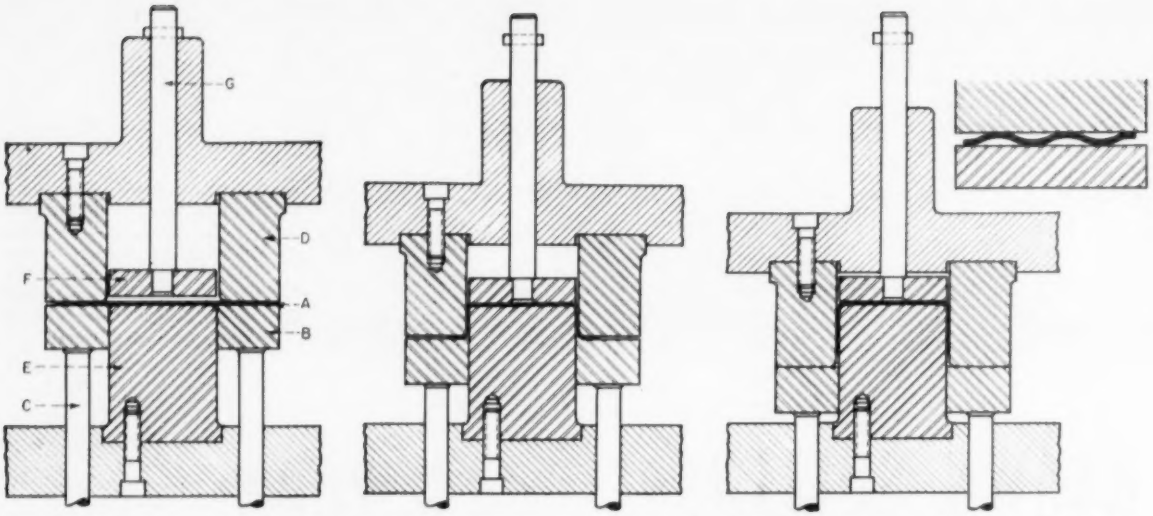


FIG. 3...Before drawing starts, the blank *A* is confined between the pressure pad *B* and the die ring *D*. FIG. 4...The shell is partially drawn by descent of the die. FIG. 5—The shell is completed or "drawn off". FIG. 6...Wrinkles form in the blank if insufficient blank-holding pressure is applied to the pressure pad. Therefore, use a pressure attachment with sufficient capacity

per, zinc, nickel alloys, and the magnesium alloys.

While nearly all grades of steel are capable of being drawn to some extent, only three grades are ordinarily used for this purpose. These are as follows: (1) drawing quality, (2) deep-drawing quality, and (3) extra-deep-drawing quality. The chief differences among these steels are: the amount of carbon and other substances they contain, their surface finish, and the care used in their manufacture. All of these grades are products of the open-hearth furnace, and they contain less than 0.10% carbon.

Drawing Quality—This grade of steel is used for shallow drawing or other operations in which the sheet is not deformed severely.

Deep-Drawing Quality—This grade of steel is used for automobile press-work and general deep-drawing operations. Extra annealing, pickling and rolling operations are introduced during its manufacture, which refines the structure of the sheet and helps to reduce "directional" effects; that is, variation in the physical properties of the sheet in different directions to that of rolling.

Extra-Deep-Drawing Quality—This grade of steel should be used for very deep drawing operations, or other difficult press operations where maximum ductility is needed. Annealing between redrawing operations can often be eliminated entirely; or when this is impossible the number of inter-stage annealings can be greatly reduced. It is not uncommon to draw a shell three and even four times before an annealing operation is necessary with this grade of steel.

Extra-deep-drawing steel is rolled from portions of selected ingots and is especially low in carbon. This type of steel is the most expensive of all grades of plain steel.

Stainless Steel—Two types are generally used for drawing operations. These are known as 17-20 straight chromium steel, and 18-8 chrome-nickel steel. Stainless steel acts very differently from plain steel during the drawing process because of the presence of chromium or chromium and nickel. Special formulas are used to compute the diameters to which shells may be reduced in each operation.

Brass—Two kinds of brass are generally used for drawing operations: 65/35 brass, and 70/30 brass, or cartridge, brass. This latter grade is the accepted standard for severe deep-drawing operations. In recent years, however, improvements in 65/35 brass make it a keen competitor in many fields previously held exclusively by the 70/30 grade. When several redrawing operations are necessary to produce a shell, and it is desired to reduce the number of inter-stage annealings to a minimum, or when the shell must undergo ironing operations, 70/30 brass should be used.

Brass sheets, which are to be used for drawing, are furnished to the consumer in a soft, finely annealed condition.

Aluminum—Aluminum is one of the most workable of the common commercial metals. The die designer should not think of aluminum as just one material, but rather as a series of alloys that come in a wide range of tempers. The characteristics of these alloys must be taken into consideration, because there is a wide difference in their behavior in the press room.

Commercially pure aluminum (2S) as well as four other aluminum alloys are generally suitable for producing drawn shapes. These alloys are designated by the Aluminum Company of America as 3S, 52S, 53S, and 61S, respectively. The first three are non-heat-treatable metals, which are rolled in four tempers. Annealed, or dead soft, sheet is designated by an O which appears after the grade number. For example, commercially pure aluminum in its softest

condition is designated as 2S-O; 2S-1/4H indicates that the sheet is one-quarter hard; 2S-1/2H one-half hard; and 2S-H has full hardness. These tempers are produced by cold rolling the sheets, and not by heat treatment.

Since these alloys strain harden as they are drawn, the greatest amount of drawing can be done with the softest tempers. Therefore, sheets that are either dead soft, or have O temper, are usually specified for deep-drawing operations. Many other drawing operations, however, can be done in the quarter- and the half-hard tempers. Very shallow draws may even be made in the full-hard temper.

Heat-treatable alloy sheets are supplied in three tempers. The fully heat-treated temper is designated by T. For example 52S-T indicates 52S aluminum alloy in its fully heat-treated condition. An intermediate temper available in some alloys, including 53S and 61S, is designated by W. The fully annealed sheets are designated by O.

Shells are generally drawn from heat-treated sheets in the annealed or the intermediate tempers, and are later brought to the fully heat-treated temper by heating after fabrication. The W temper is used whenever possible, to eliminate the need of heating the shells after they have been drawn. Drawn shells are often difficult to handle and may become distorted by the heat. In most cases it is necessary to correct the distortion by a restriking operation.

Copper—This metal has excellent drawing properties, often superior to those of brass and extra-deep-drawing steel, and is used in numerous parts.

Zinc—Zinc can be readily drawn, but not to the extent of other metals. Smaller reductions than are commonly used for steel are necessary. In some instances where the draw is severe, it may be necessary to warm the blanks.

Nickel and Nickel Alloys—Pure nickel and nickel alloys, such as Monel metal, Inconel and nickel-silver have excellent drawing properties and are frequently drawn into very deep shells.

Magnesium—Magnesium-alloy sheets are made in three grades for forming and drawing operations. These are known as AM3S, AM-C52S and AM-C57S. In general AM-C52S alloy has better forming and drawing characteristics than AM3S and AM-C57S. Sheets are made in three tempers—annealed, hot-rolled and hard-rolled, designated by the suffixes O, R and H respectively. Forming and drawing properties of annealed sheets (O) are greatly superior to those of hard-rolled sheets (H). Properties of hot-rolled sheets (R) are intermediate between those of the O and H tempers.

At room temperatures, magnesium can be drawn to a limited extent only. In order to make reductions equal to those possible with steel and aluminum the blanks must be heated. The best working temperatures for forming and drawing the three grades are: 650 F for AM-3S, 600 F for AM-C52S and AM-C57S, with an approximate range of 50 F. Temperatures as low as 350F. may be used for moderate forming operations to minimize the loss of yield strength caused by heating.

Part II of Mr Cope's series will appear in an early number

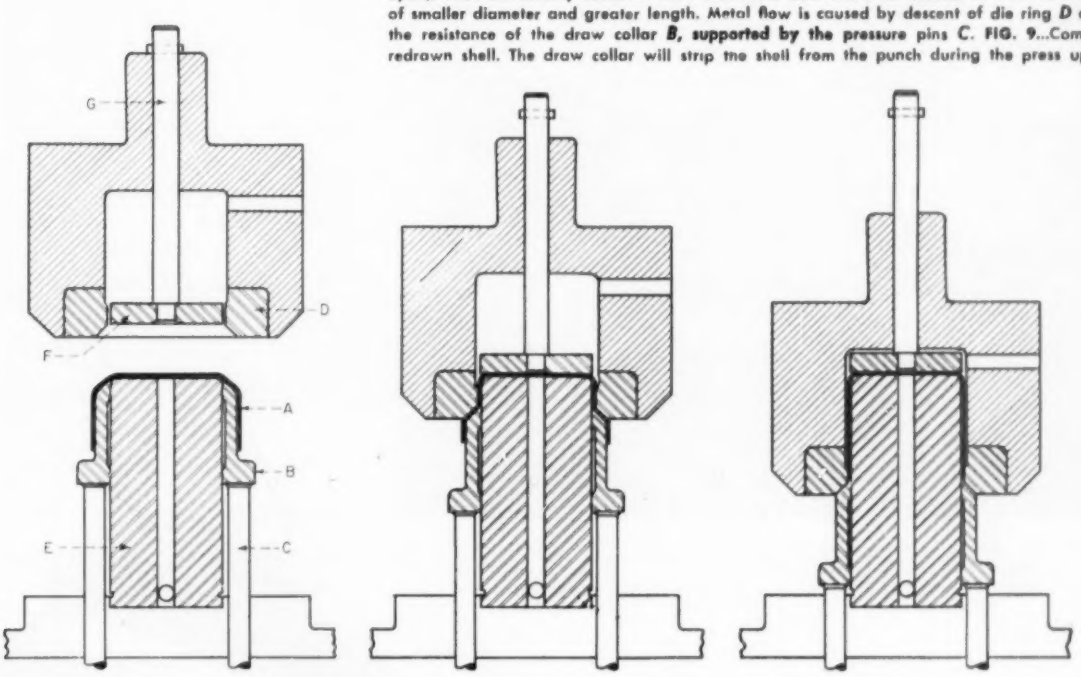
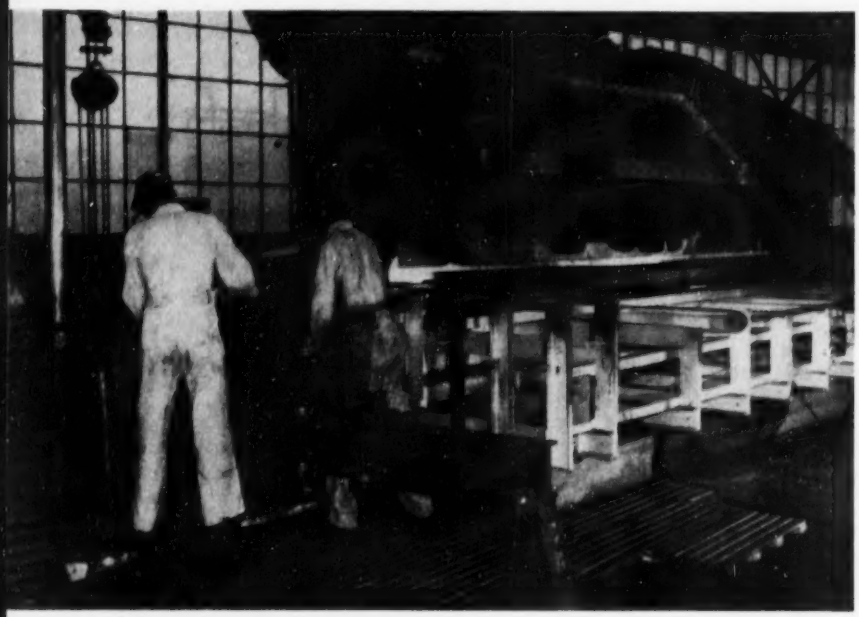


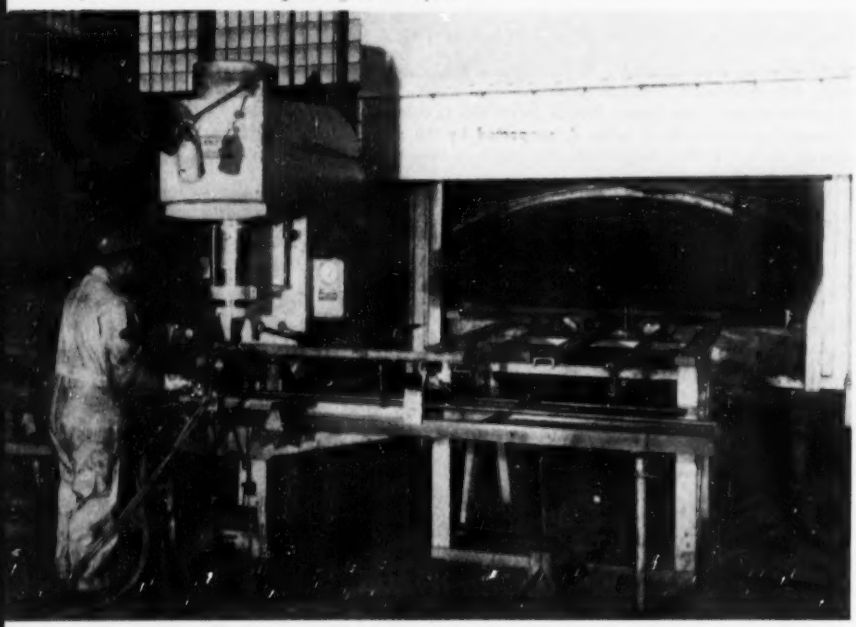
FIG. 7...When a drawn shell *A* is to be redrawn, it is placed over the draw collar *B* (with dies open). **FIG. 8**...Partially redrawn shell illustrates how metal is caused to flow into a shell of smaller diameter and greater length. Metal flow is caused by descent of die ring *D* against the resistance of the draw collar *B*, supported by the pressure pins *C*. **FIG. 9**...Completely redrawn shell. The draw collar will strip the shell from the punch during the press upstroke

Working-height handling moves tank

BY RUSSELL A GRAHAM, Wks Mgr, MAREMONT AUTOMOTIVE PRODUCTS INC



PRODUCTION STARTS with bars sawed to length, then traversed along open side of Sunbeam-Stewart furnace to heat ends for cold heading at Acme machine (left). Large screws with 4-in. pitch move the bars along during 38-min cycle



ANNEALING GOES ON at Jet Combustion furnace, where another screw delivers headed bars to Hannifin hydraulic press for straightening. Bars ride on rolls (at the press) driven by air motor; dial indicator shows operator distortions caused by heating and fabrication up to this point

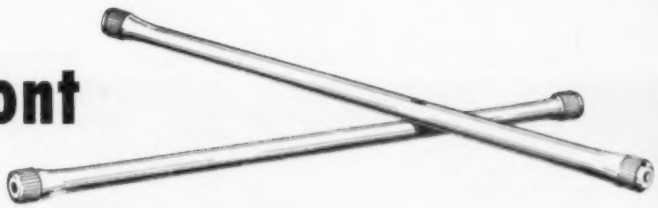
A torsion-bar spring is a long rod, shackled to the frame of the vehicle at one end, and connected to the axle or bogie-wheel assembly at the other end by a support lever. As the load increases, the bar twists more; as the load lets up, untwists. In service, the bar flexes constantly and often oscillates rapidly; therefore high quality inside the bar's structure and fine finish are important, for any flaw, once developed, tends to rupture rapidly.

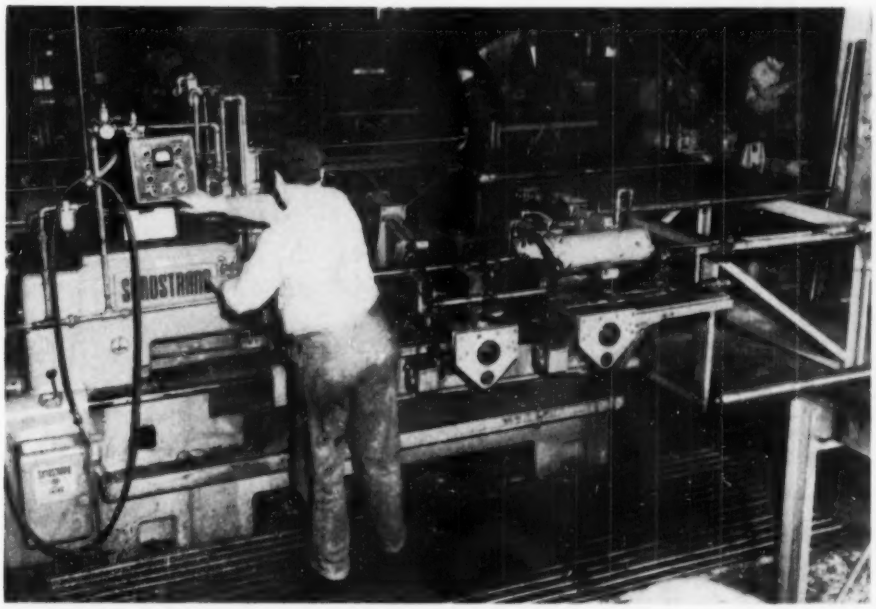
Stock is usually Magnaflux-quality **TS-8660** high-chrome hot-rolled bar, and may be made into springs up to **96** in. long and from 1⅛ to 3 in. in dia. All springs go through the same sequence of fabricating operations, so the Maremount set-up is tooled for constant flow with equipment that can handle any of the spring sizes in the range being built.

Handling is a major cost of the operation, and has been organized to be kept to a minimum. Some lift-truck handling is necessary, particularly to move stock between major machine groups and in from the storage area; but most handling between machines, in a given line, is done with waist-high rails that gravity-feed the bars along the route. The rails are relatively inexpensive, even though each rail is an angle with a wooden face inset into the V.

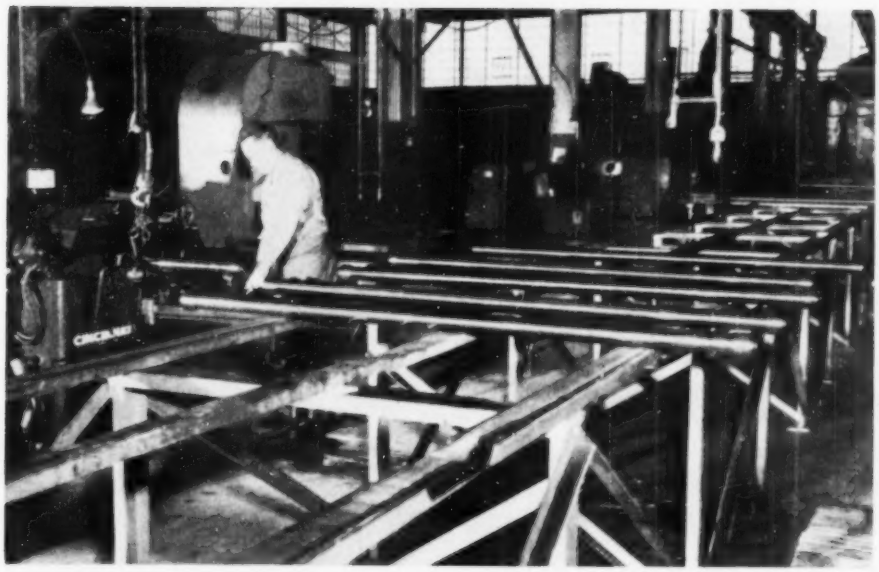
Other materials-handling equipment includes hoists at some machines, where it is not expedient to have the rails lead the bars right up to the spindle; and a special loading rack at the heat-treat furnace, which allows constant load at the furnace.

springs at Maremont





LATHE GROUP DOES CONTOUR-TURNING after shot-blasting, centering, and cut-off have been completed. First lathe cuts end and shank down to the center; other completes the job. V-rails with wood facings inside the V's carry bars at spindle height between machines



GRINDING AND HOBBING SECTIONS use same kind of rails for transferring the work. Bodies are finished on Cincinnati centerless grinders equipped with special bar supports which protect finishes and cut operator effort

Two advantages stem from handling torsion bars at about 3 ft off the production floor; one is the elimination of much of the usual vertical movement in many plants—hence savings in time and effort; the other is in more careful handling to protect a product that must be highly accurate and finely finished. The torsion bars support tanks, heavy tractors, and bulldozers as a coil or leaf spring would

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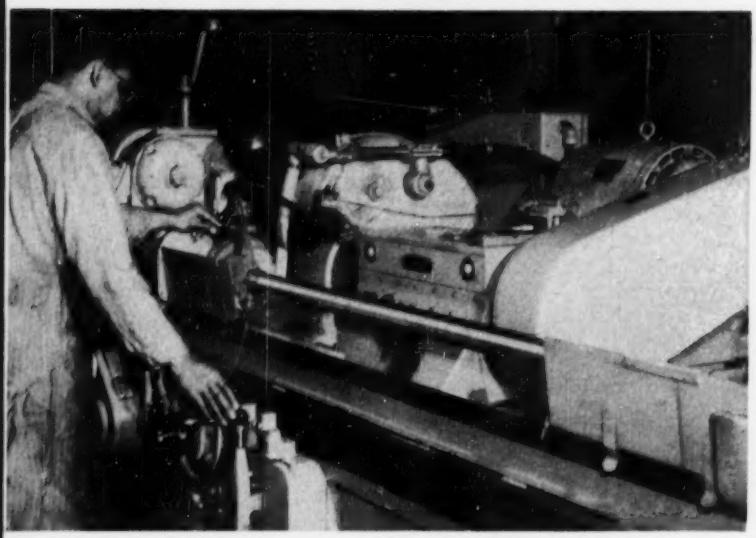
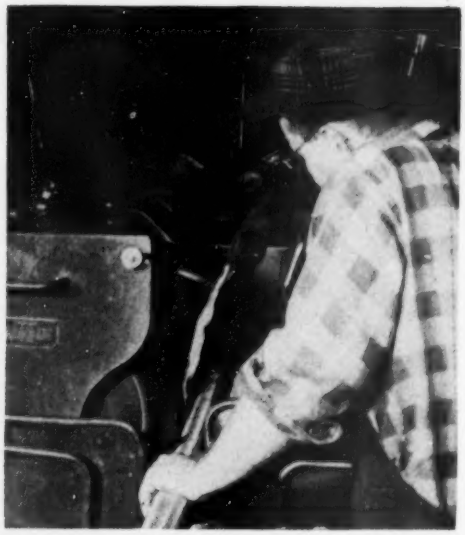
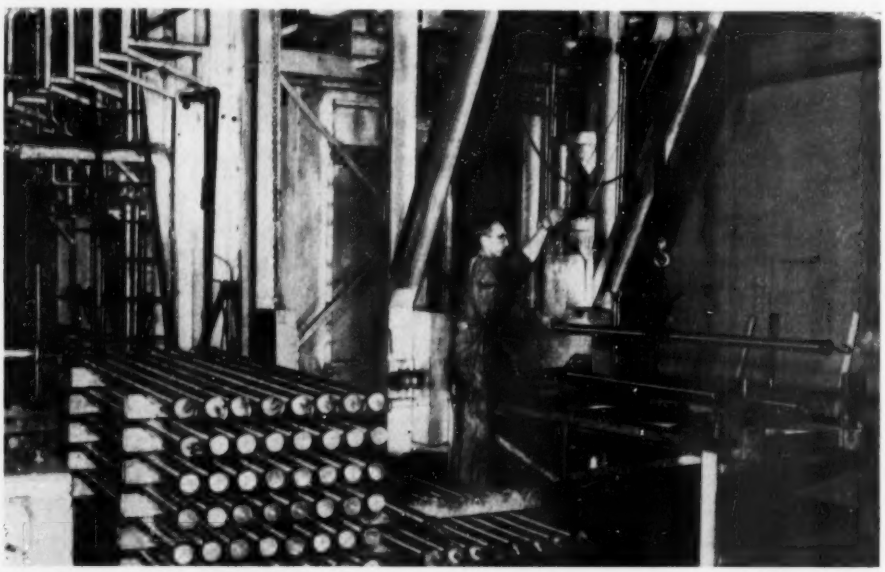


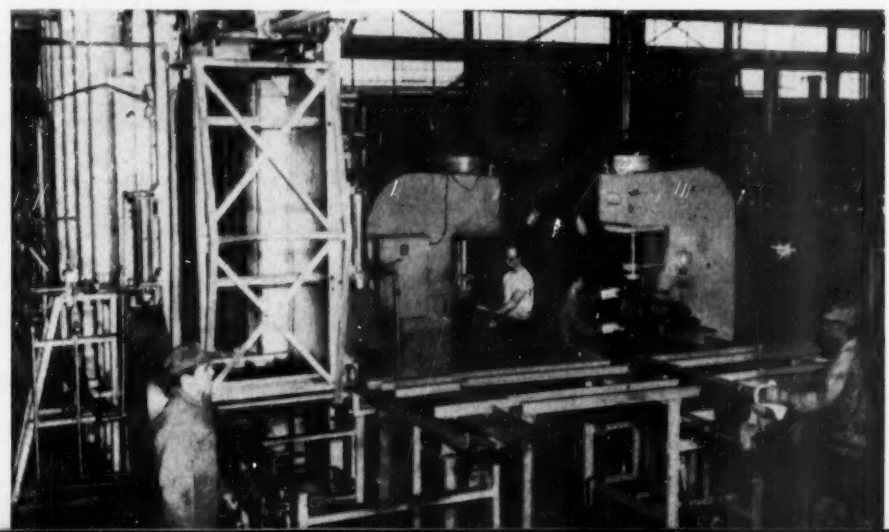
BAR ENDS ARE GROUND within +0.0005, −0.0010 in. on Norton cylindrical grinder with Arnold gage for size control. At this stage, bodies are finished within ±0.005 in. Grinding wheels for all jobs are rubber-bonded



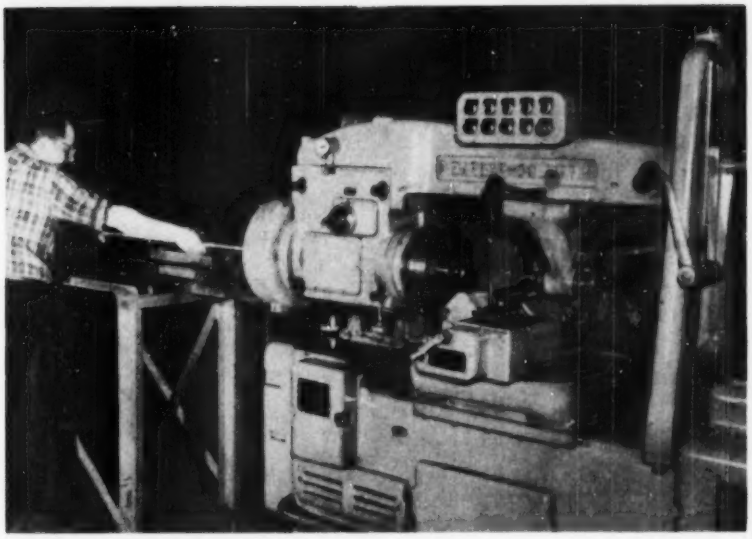
FINAL GRINDING requires blending of radius and angle between head and body on each end of bar. Two grinders, one on each side of transfer rails, do alternate ends of workpieces, which eliminated end-for-end turning



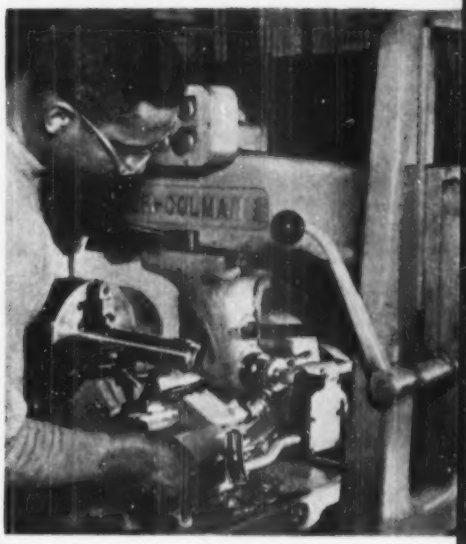
HOLES IN BAR ENDS are threaded on Edlund tapper, then bars are delivered by lift truck to automatic Sunbeam-Stewart furnace for hardening, quenching, and drawing. Hooks threaded into holes will support bars during cycle. Bars are laid on loading rack for transfer to furnace elevator. Note padded hoist grip



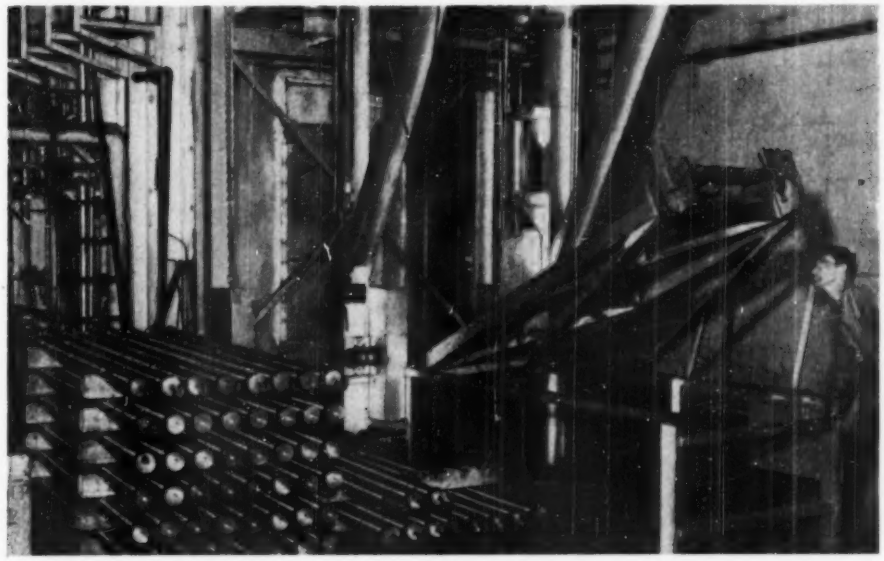
HOT BARS ARE STRAIGHTENED again after discharge from furnace, when temperature is still from 700 to 750F. Four Hannifin presses do a job similar to earlier straightening operation. Heat keeps down internal stressing that might weaken the bars later



SPLINES ARE HOBBED on Barber-Colman machines, where bars are inserted through the machine spindles by means of carriages that shift the bars from transfer rails. Hobbers are located on each side of the rails, like lathes and grinders



HOBBER CENTERS ARE RESET with torque wrenches to same pressure for each bar, which reduces distortion trouble. Copper cover is placed over cutter when bars are being set up or taken out to prevent damage to teeth or work



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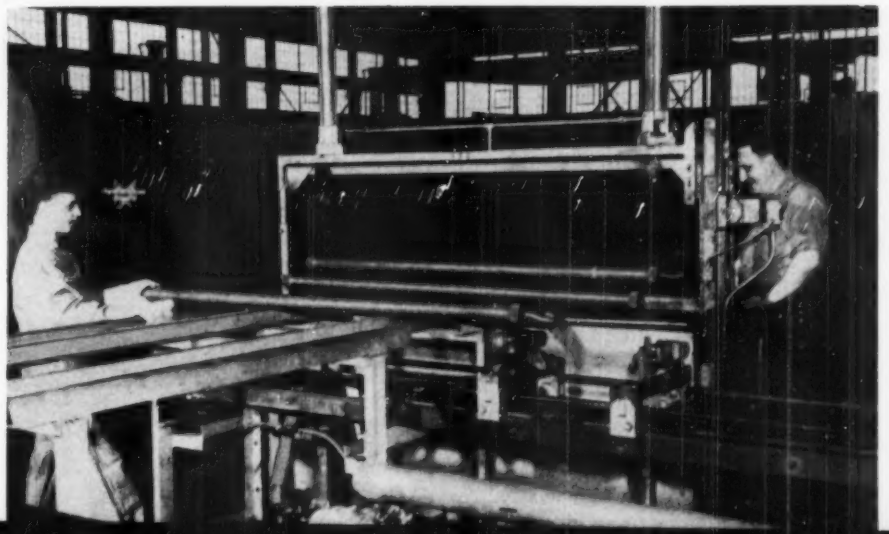
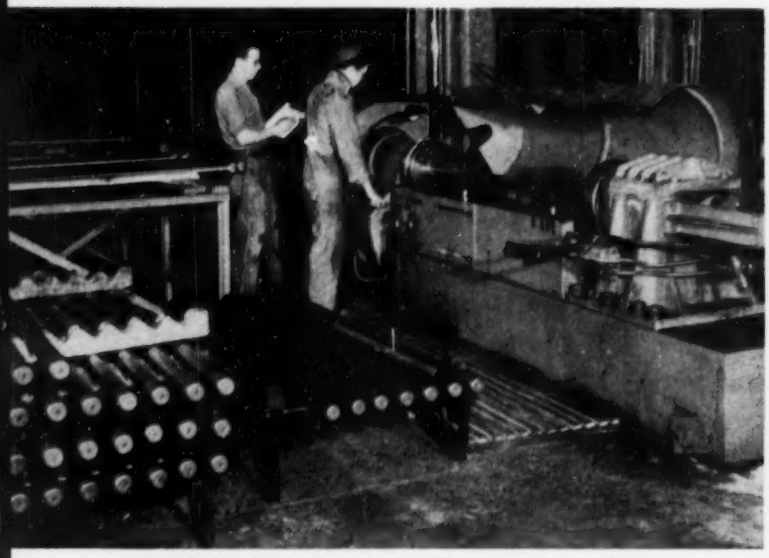
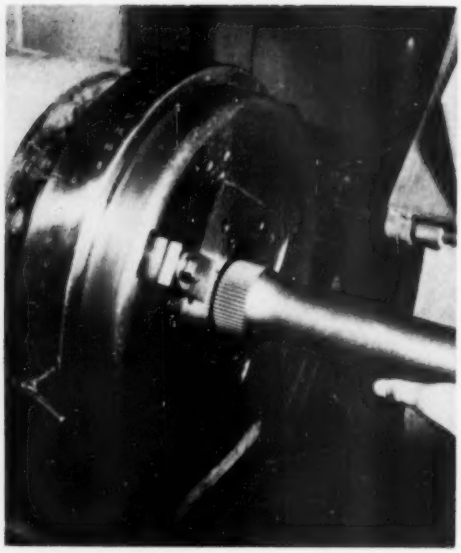
LOAD IS RAISED to vertical position for automatic switch to elevator that fills hardening zone. Number of bars loaded each time is controlled to keep furnace at capacity of 500 lb/hr



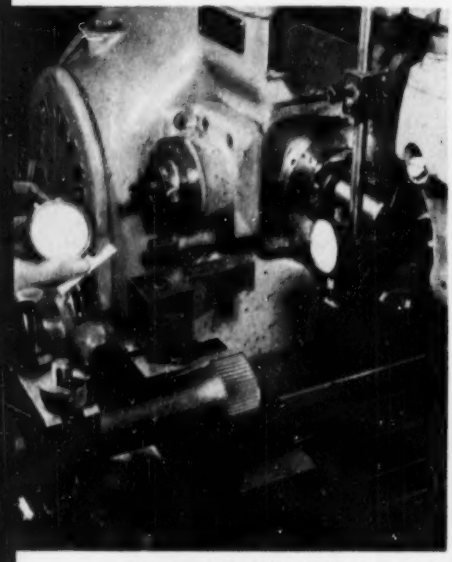
BARS ARE COOLED to room temperature by lowering them into water tank by means of an air-operated rack. Next operations are Magnaflux inspection, demagnetization, and shot-peening to bring reading to 17-20 on Almen A gage



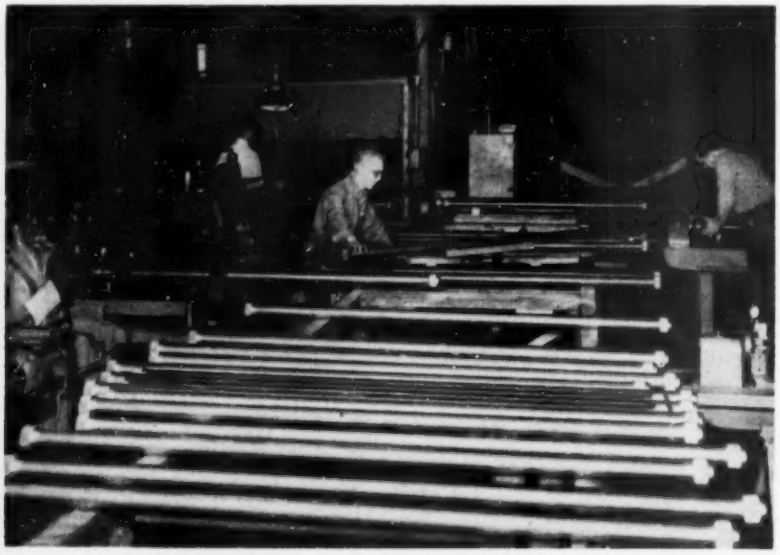
PRESTRESSING IS DONE on Yoder rack-driven machine, which twists bars to predetermined torque. Chalk line along bar gives visual check on whether twist is progressive or concentrated at one end. Bars are twisted both left and right



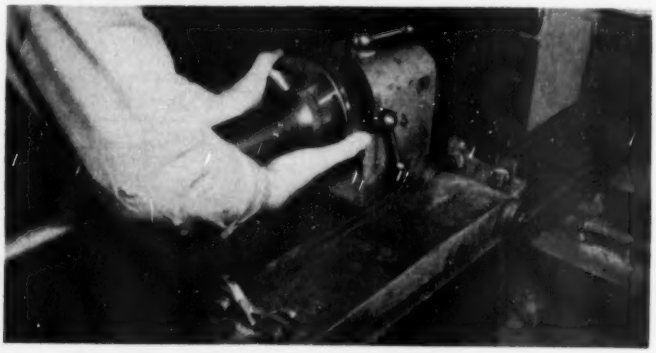
ANGULAR GRADUATIONS on Yoder headstock give reading on amount of twist given each bar to produce required permanent set. Record of this is filed



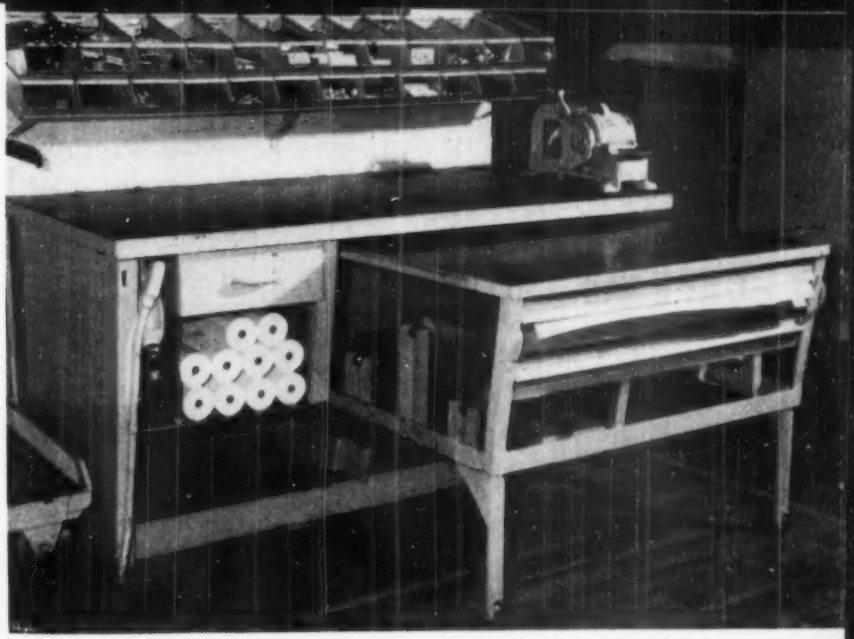
ONE TOOTH IN EACH SPLINE is cut away on Sunstrand Rigidmil. Fixture is fitted with swinging gage arm (parallel to work in photo) which locates the work by fitting over the tooth to be cut away. Then fixture is clamped, and cut is made. Dial indicator is for depth check on cut part. The cutter has a 6-in. OD, 12 teeth, and operates at 200 rpm taking 0.003-in. feed per tooth



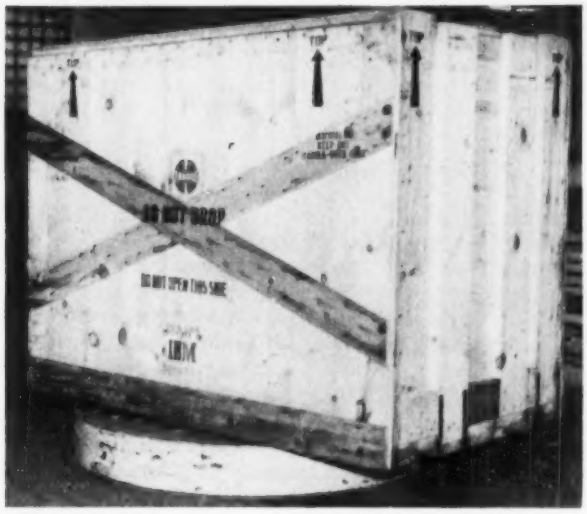
WAIST-HIGH RAILS move bars from stressing section to finishing area, where flats are milled at ends, final inspection is made, and bars are sprayed with synthetic-rubber liquid. Air lift in center raises bar for end-for-end turning at miller



FINAL INSPECTION calls for spline gage that also checks flattened tooth. Inspection is 100% on all dimensions



SPECIAL BENCHES are used for wrapping supplies, such as ribbons, lubricants, and small parts or assemblies shipped separately. The castered extension unit carries 36-in. rolls of kraft, waxed, and VPI paper fed to the face where cutoff knives are mounted. Cleats, cartons, and listing paper go under the bench top. Stockbins hold parts customarily separately packed or used in packing

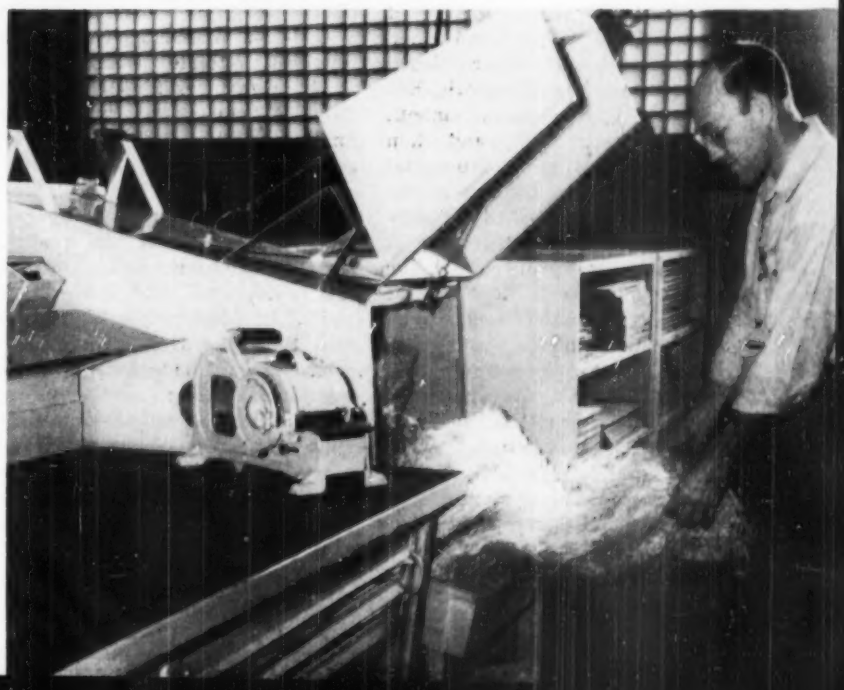


IBM Packs Efficiently Too

At Endicott, NY, International Business Machines Corporation matches shop efficiency and mechanization with unusual packing equipment. Products are brought in by power truck, vary in size and shape too much for automatic packing. But special units aid packing, and some reusable containers with bolted joints can be employed

BY HERBERT CHASE

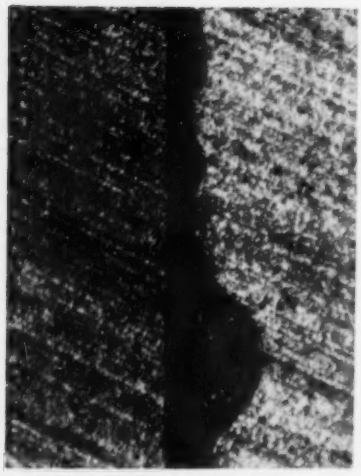
WOODEN CASES are trucked in from a storage yard, forklifted to this turntable lift, which can be set at any level from the floor to 18 in. above it by means of a compressed-air cylinder. The top has rollers so the loaded case can be moved easily. Thus air wrenches can be used, and manual lifting and pinchbars are avoided



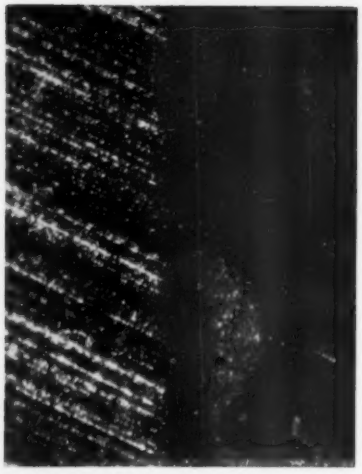
EXCELSIOR BALES are placed in sloping steel cabinets. The open end is protected by a hinged steel cover held up by a chain and a fusible link so it closes in the event of fire. Packing cartons are stored collapsed in the cabinet at right, are placed on the floor or on a slideout extension (as in this case) for filling

How sharp are carbide tools finished with silicon carbides?

BY JOHN C REDMOND,
Vice President
Research and Development
KENNAMETAL INC



TAKEN WITH NORMAL LIGHTING, this 100X photomicrograph shows cemented carbide tool edges ground with 100-grit diamond wheel (left) and 60-grit silicon-carbide wheel (right) placed face to face on ground glass of optical comparator. Spectrographic analysis of material in voids along edge of tool at right show it has a high silicon content



POLARIZED LIGHT used when taking 100X photomicrograph of tool edges shows with greater clarity the high-silicon material embedded in the rough edges of the cemented-carbide tool (at right) finished with a silicon-carbide wheel. Spectrographic tests of tool sharpened with diamond wheel (at left) do not show any indications of silicon

Considerable controversy has been developed during the past year over the relative merits of finishing cemented-carbide cutting tools with silicon carbide and with diamond grinding wheels. The results obtained from each of the many series of comparative tests made by proponents of the two methods appear to prove only that either type of wheel can be used effectively.

But little attention seems to have been given to the true nature of the cutting edges produced when cemented-carbide tools are finished with the two different wheels. Because the edges appear smooth when inspected visually, and when tested by drawing a thumbnail across them, it has been generally agreed that tools finished properly with either type of wheel are of comparable quality and should give about equal results in terms of tool life when used under comparable conditions.

Study of the accompanying photomicrographs indicates that this is not a safe assumption. Taken in an attempt to obtain a photographic comparison of cutting edges produced under similar conditions by approximately similar diamond and silicon-carbide grinding wheels, these 100X enlargements of cemented-carbide tool edges show that rough edges of the tool ground with a SiC wheel (at right in each case) seem to be filled with a foreign material.

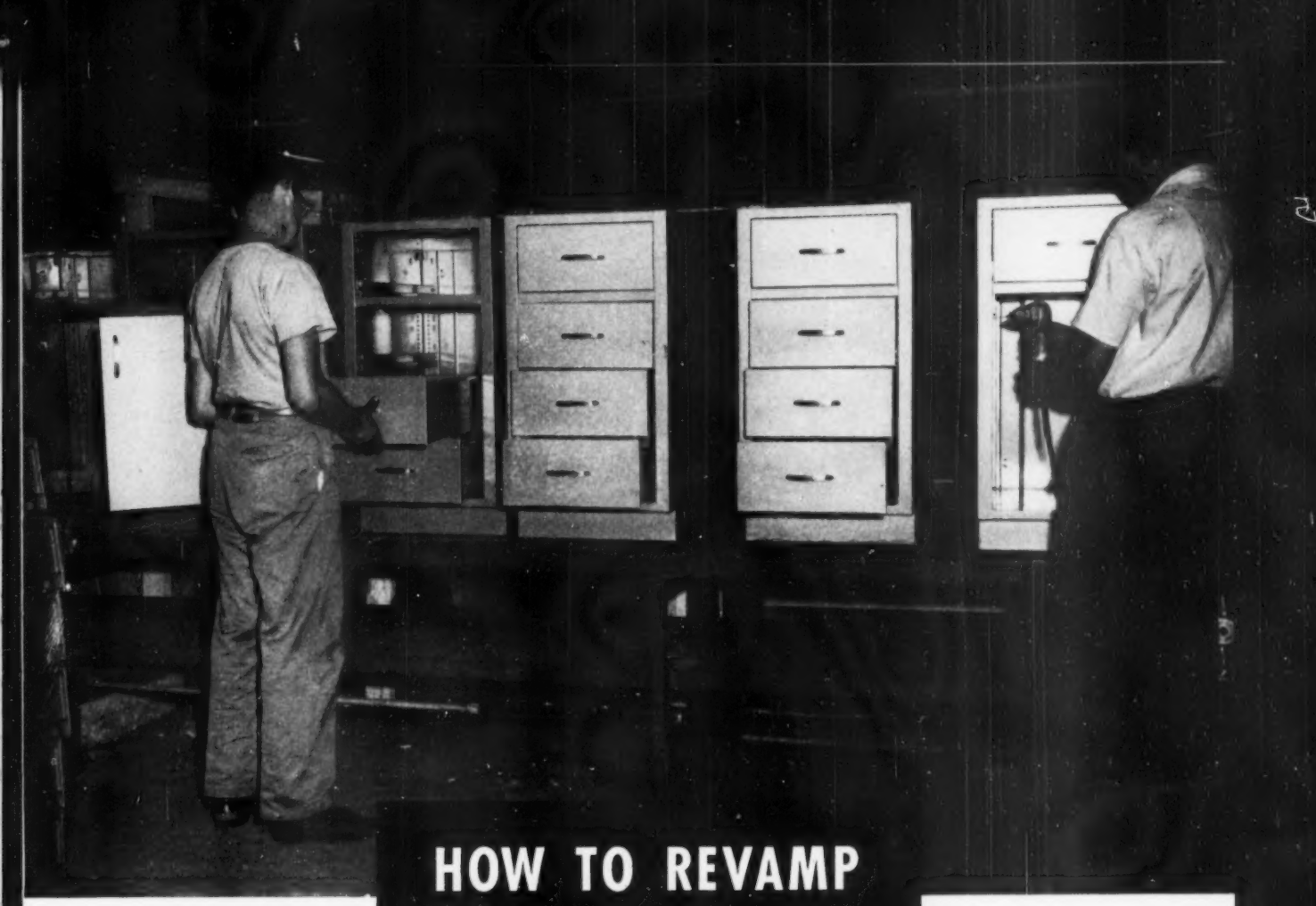
Both tools were rough and finish ground offhand by the same operator in the Kennametal plant, and in each case the wheels were flooded with a water-soluble coolant. The tool at the left in each photomicrograph was finished with a 180-grit diamond wheel (the roughest available), while the tool at the right was finished with a 00-grit silicon-carbide wheel (the finest available). Identical procedures were used.

When compared visually, and with the fingernail test, the two tools appeared equal in quality. But the photomicrographs prove this is not true. Nor is it a rare and nonreproduceable phenomenon. Since the first of these comparisons was made a little more than six months ago, similar studies of tools finished with silicon-carbide wheels have been made a number of times—always with identical results. It has been observed, however, that with coarser silicon-carbide wheels, the effect is magnified and, conversely, it is believed that with finer-grit wheels the effect would not be much in evidence. Work with silicon-carbide belt grinding has shown that this effect may also occur.

Equipment available in the Kennametal laboratories for spectrographic analyses has given definite indications that silicon is the major constitutent of the coating embedded in the ragged edges of the tool finished with the silicon-carbide wheel. Similar tests of tools finished with diamond wheels have not shown any indications of silicon being present.

It is our belief that the high-silicon coating is deposited by the wheel, and that it probably is mechanically locked in the surface voids of the tool by pressures and temperatures developed during grinding.

We had not observed this phenomenon in any previous studies of carbide tool cutting edges, nor have we come across any references to it in studies reported by others. It possibly is one of the principal reasons why identical cemented-carbide cutting tools show such a wide variation in effective life.



Final assembly of new "Interflex" laboratory cabinets

HOW TO REVAMP A MODERN PLANT

BY EDMOND J JAMES,
Industrial Engineer,
METALAB EQUIPMENT CORP
HICKSVILLE, L.I., N.Y.

Alertness is the key both to marketing a product and to building the facilities to make that product more efficiently. Organized only 8½ yr ago, the Metalab Equipment Corporation is already a leading firm in the laboratory-furniture industry. But Howard M Plant, president, is looking to the future. He isn't satisfied with a plant having methods typical of his industry. He wants a shop that can produce faster and make a better product.

To Mr Plant, it seemed that some of the methods of the mass-production industries could be applied successfully to a typical sheet-metal fabricating shop. His question was: "Can you do this at a cost consistent with potential results?"

The answer is definitely "Yes." Our manufacturing facilities have been completely overhauled. We have installed presses, welders, waterwash spray booths, conveyorized drying ovens, and assembly conveyors. Our standard product moves in a straight-line flow; our specials are more easily handled. We can make faster deliveries.

On some operations our production rate is ten times faster than it was before. On other jobs we now make a piece in one step instead of 20. Our tooling is capable of making the same style of part in several sizes.

We expect to double our production in the same floorspace. Heretofore, we have always lacked space. With manufacturing methods typical of the industry, the tendency was for great quantities of partially finished, bulky assemblies to build up at various stations. This situation slowed production, increased materials handling, and raised costs. But by applying automotive-plant methods, tailored to fit our particular problem, we look for continued progress.

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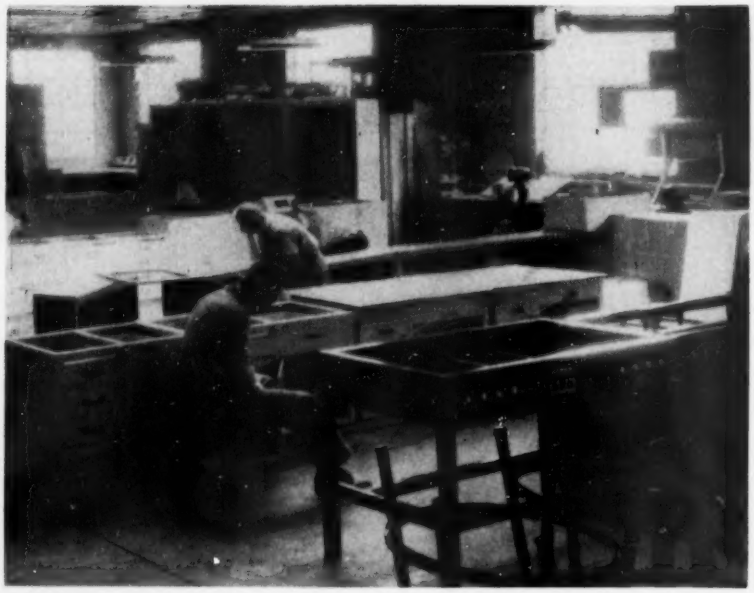
how automotive methods were adapted



BEFORE . . . Final assembly originally followed typical low-production practices. Extra handling was unavoidable. A smooth working pace could not be achieved

Most people would consider an engineer crazy if he suggested applying automotive methods in a 200-man shop. But by the use of fabricating methods customary in the laboratory-furniture industry, Metalab Equipment Corporation had reached maximum output in its new plant at Hicksville, LI. To increase production, it was a case of either adding more floorspace or using what they had more efficiently. And even though their annual volume was already several millions, there was a limit to how much could be invested as dictated by good business judgment. Analysis of the situation revealed:

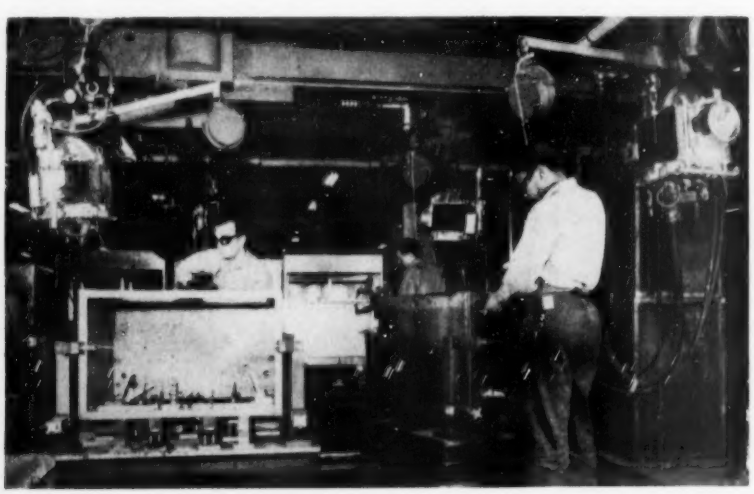
TOOLING

Old Setup. The parts for laboratory cabinets, cases and hoods are essentially the product of press brake and press. These parts are welded together into strong, carefully aligned sub-assemblies. These must fit together properly at final assembly for cost reasons.

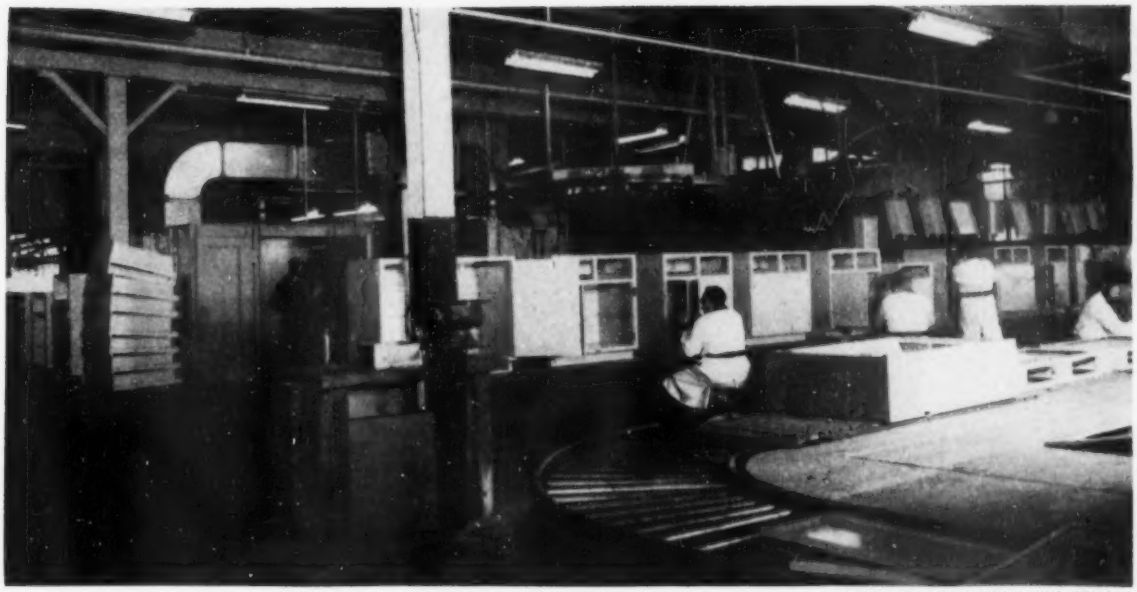
With low-production tooling for blanking, punching, notching, forming and similar jobs, they often had to make as high as 20 setups to produce a specific part. Parts runs were short. Stock in process piled up. Parts were not interchangeable between several styles of cabinets, drawers, doors, etc. Close tolerances could not be maintained. This meant rework, because the product must be square and in good alignment, and able to take hard service.

Solution. To get interchangeability of parts, and maximum utilization of parts in different subassemblies, they designed the "Interflex" line of cabinets. With this new line, doors, drawers, etc, are readily interchanged and arranged in a wide variety of ways to suit the customer's requirements. They expect to build a lot of these subassemblies for stock, and thereby

BEFORE . . . Much metal finishing was required on cabinets assembled by spot welding



AFTER . . . Gun welding of cabinets in fixtures carried by a loop conveyor is faster, and the tolerances on squareness of openings is 1/64th. Much labor is saved



Photographs by Frank Mallett, Hicksville, L. I.

AFTER . . . Roller conveyors put cabinets at convenient height for final-assembly operations. Tasks are divided among stations. Maximum skill is developed by operators

cut the customary delivery time.

Product design kept tooling in mind. They shifted from low-production tooling to progressive dies. These dies are made with fixed and movable sections. Thus, a whole series of the same style of part, varying only in length and a few details, can be processed on the same tools. They get as many as 20 operations at once, every part is identical, and they can hold tolerances never before attained in this business. These tolerances help at assembly and give them a much better product.

PRESSES

Old Setup. Their presses were small and none with pressure capacity or tooling space to handle large progressive dies.

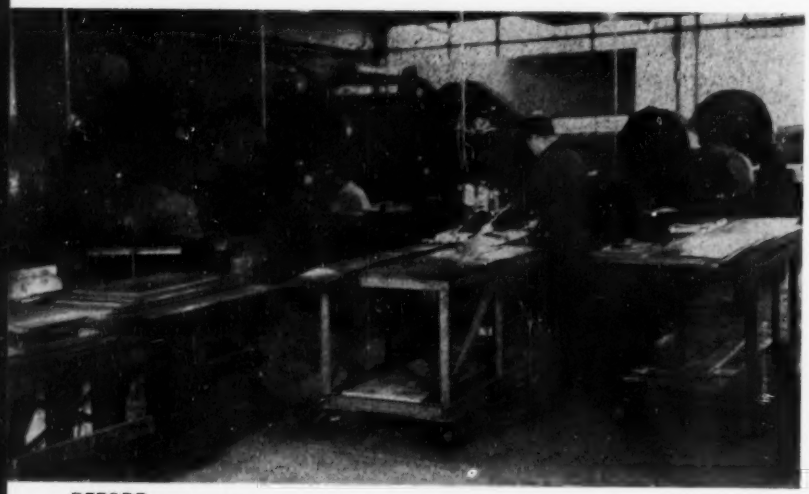
Solution. In the automotive industry, they would probably pick a 300-ton press to handle Metalab's largest jobs. A machine of this size is far too expensive for a small plant. By analysis of the die program and an original study of how to use the kinetic energy of the flywheel, they were able to limit themselves to a far less expensive 150-ton press. Experienced people told them that they could not do certain jobs in this size of press. The fact is: the dies are running, the press has not broken and they are getting up to 25,000 pc per grind from the high-carbon, high-chrome dies. Selection of the press will be discussed later.

FLASH WELDING of door frames is eight times faster than arc welding, the product is square and flat. All sizes of frames are made on one welder, using an adjustable fixture

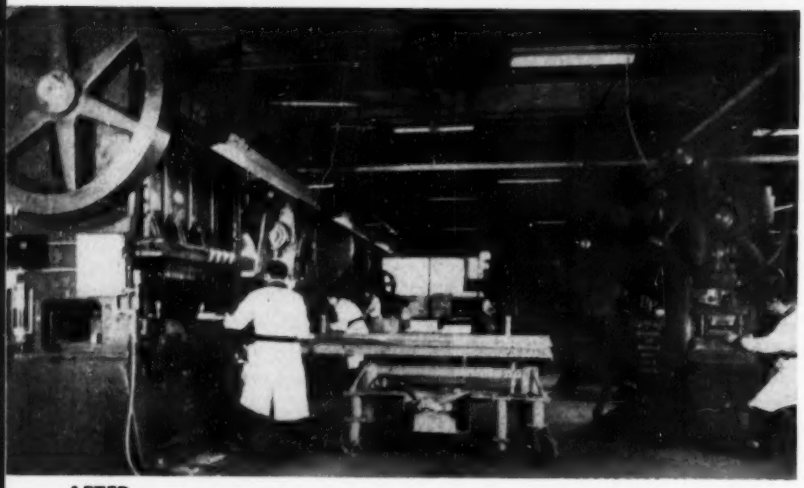
WELDING EQUIPMENT

Old Setup. They had a 3-phase, 600-amp bus duct about 150 ft long and floor-type spot welders. Metalab cabinets are bulky. This meant that two men had to handle work at the spot welders. In any case, only one spot was produced at a time. A large increase in production would have meant many more welders and much more floor-space. It would be impractical to use jigs to speed production and keep the product square and in alignment.

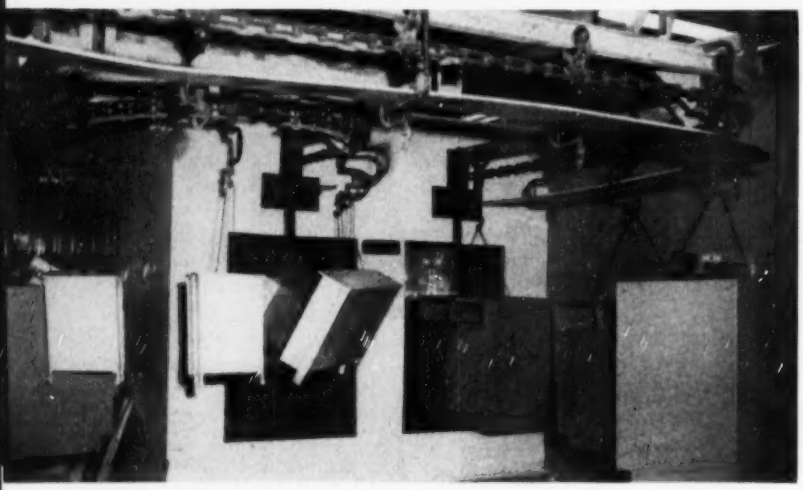
Doors were arc welded. Each piece had to be cut, assembled in a jig, arc welded, and the welds ground flush. Distortion was unavoidable. Production was slow.



BEFORE . . . Typical small presses were the only ones installed at Metalab before the revamping of methods and equipment. This forced the shop to make many setups for some parts



AFTER . . . Installation of a 150-ton press with adequate die space for progressive dies to make the largest stamped parts is a major step in securing of mass-production methods



A CONVEYORIZED DRYING OVEN for painted cabinet part insures a high-quality finish, because baking time and temperature are controlled

Solution. Cabinets have been redesigned for gun welding in fixtures on a merry-go-round conveyor. This conveyor is similar to the first of its kind that I installed at the Briggs Waterloo Avenue plant in Detroit in 1927. Fixtures are moved in an elliptical path by a chain conveyor, six fixtures for standard cabinets and two fixtures for specials. With three men to load fixtures and two men to load and unload, they can turn out substantially increased quantities of cabinets daily.

Doors are now projection welded. This necessitated a change in design of the hinges, so no spots will be seen. An adjustable fixture with the upper and lower electrode attached now handles all sizes of doors.

AIR COMPRESSORS

Our air supply was too small to handle the increased requirements for gun welders, press clutches and other purposes. Hence we installed two more air compressors rated 400 cfm.

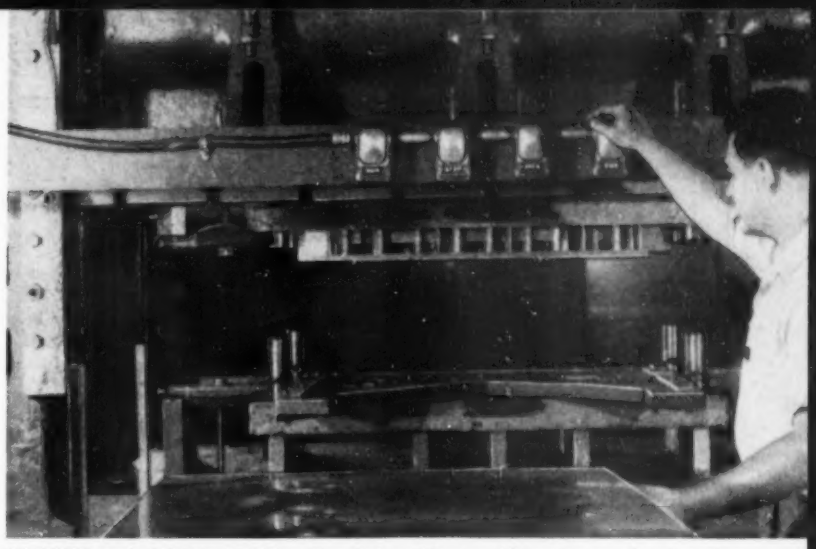
PAINTING AND FINAL ASSEMBLY

To insure more healtful conditions and a cleaner shop, they installed conveyorized water-wash spray booths. Sprayed work passes into a conveyorized baking oven, where the finish is dried under controlled conditions of time and temperature, then passes to the assembly area.

Final assembly was formerly done with cabinets resting on the floor. This system was awkward for operators, and moving the heavy cabinets required the services of men. Products could be damaged by jostling. In the new system they have powered conveyors which puts the work at convenient working height and enables it to be moved easily from station to station. Thus, they are now in position to develop maximum skill in assembly operators, to use women for many tasks. The conveyor also serves as a quick visual check of final work in process and makes inspection for missing details much easier.

Detailed discussions of their new tooling and the power distribution system are given on the following pages.

how to select a press by flywheel energy



CONTROLS marked (left to right) Run, Stop, Inch and Run provide maximum safety in setting up and running the 150-ton press. Die is shown set on risers for slug clearance

Our program calls for making as many parts as possible in progressive dies instead of single-operation tools, in order to achieve: (1) closer tolerances, (2) fewer rejects, and (3) labor savings. Parts like ours require rather large progressive dies.

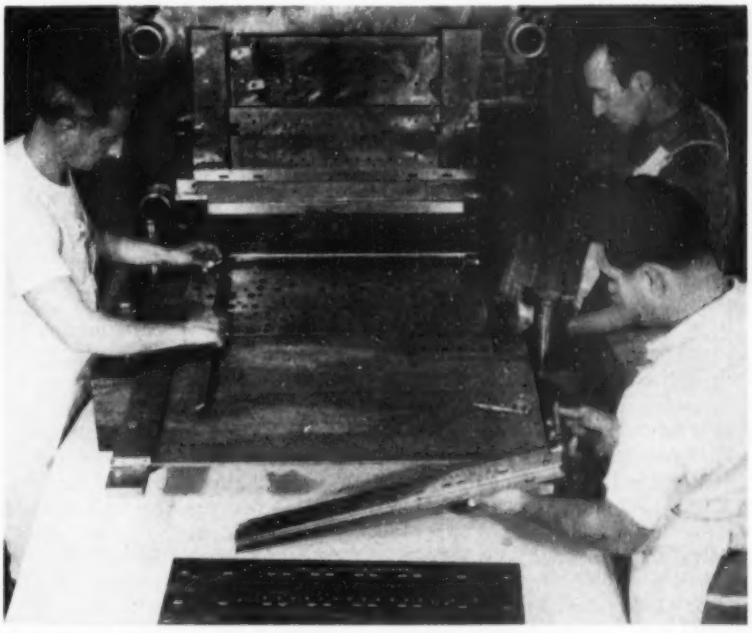
In the automobile business, we might have picked a 300-ton press, after looking at the average jobs, and let it go at that. But a smaller plant has much less money to spend on equipment. My job was to balance all of projects we had in mind and apply as many mass-production ideas as possible within a certain budget.

The starting point was the knowledge that we had to have progressive dies. In designing dies, we called for fixed and movable sections, so that the same style of part could be made in several lengths. The fixed section does the left-hand end of the piece, which is always the same. The right-hand end of the die has movable sections to allow for making several lengths of part, or varying the positions of notches, holes, etc. In other words, we feed the lead-coated sheet from front to back of the press.

Some of our forming operations are relatively severe. The tonnage required for form and cut-off would normally exceed the capacity of our press, were it not for certain features of die design. If you add the tonnage for the other operations in the die, you would say that we would have to have a 300-ton press. Actually we are using a 150-ton press and it is not overloaded. The secret is proper utilization of the kinetic energy in the flywheel. More will be said about this later.

There are a number of factors to be considered in selection of a press. An important one is tooling space.

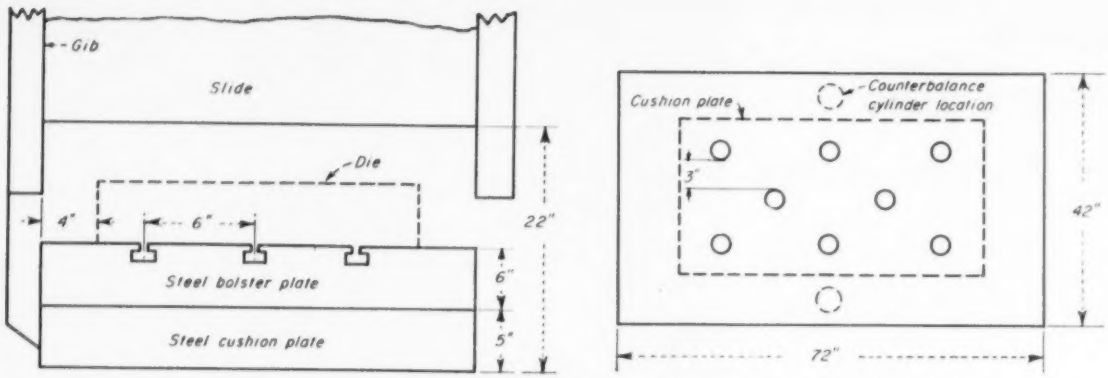
Shut Height. Many of our dies require use of the cushion in the bed to actuate forming members and other die details. Therefore, we need a cushion plate and a bolster plate. The majority of our dies average 10 in. shut height, but some go to 11 in. Our bolster and cushion plates total 11 in. thickness. So we chose a press with a 22 in. shut height (see sketch), this being the distance from the bed to the ram, slide down, adjustment up.



PROGRESSIVE DIES are built of high-carbon, high-chrome die steel, and are among the largest used in the East. Such tools should give well over 1,000,000 pieces

Bolster Size. From analysis of the widths and lengths of our dies and potential needs, we decided upon bolster and slide dimensions of 72 x 48 in. The 72-in. length, *inside the gibs*, gives us 4 in. at either end for clamping the punch and die members to slide and bolster.

Cushion Plate. A predrilled cushion plate, made to JIC standards, is excellent for production shops. For a job-shop situation, I prefer to drill the 1-in. pin holes in the cushion according to the needs of my dies, and number the holes with the appropriate die numbers. An expensive sub-plate construction is thereby avoided, and the position of the holes is not limited to a predrilled pattern. Also



TOOLING SPACE of the press was selected to give adequate clamping space (4 in.) at either end inside the gibs, and suitable shut height (22 in.) when highest dies are used with both the bolster plate and the cushion plate. Slide adjustment is motorized to save time

in a jobbing shop, one will run a variety of dies in the same press. To avoid wear on the dies and the press, the dies must be set at their load center, not merely on the centerline of the bed. This consideration affects the location of cushion holes.

Load Centers of Dies. The load center of each die should be calculated and then marked on the die. This marking should be set to the centerline of the press, right to left. The calculation of load centers is not difficult, even for a progressive die. This is the method:

1. Assume that we punch a row of equally spaced holes in the first station. Obviously, the force F_1, equal to the tonnage to punch these holes, acts through the center of the die.

2. At the second station, we will notch one end of the piece and trim. Obviously the resultant force F_2 is close to the end of the die and tends to cock it.

What is the true load center of the die?

According to the law of moments, a resultant force acting at the load center should balance the effect of forces F_1 *and* F_2, acting at distances d_1 and d_2. (See sketch).

Then $F_1 \times d_1 = F_2 \times d_2$

D = distance between loads $= d_1 + d_2$

But $d_2 = (D - d_1)$

Then $F_2 (D - d_1) = F_1 \times d_1$

Example:

Assume that $D = 28$ in., $F_1 = 72$ tons, and $F_2 = 40$ tons.

Then $d_2 = 28 - d_1$.

Solving the above equation:

$40 \times 28 - 40\ d_1 = 72\ d_1$

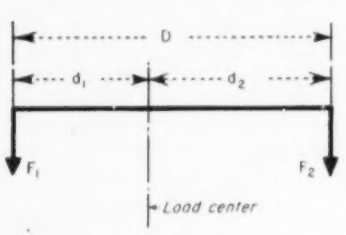
$d_1 = 10$ in.

Therefore, the load center is 10 in. to the right of the die centerline.

So far we have talked about load center, right to left. If the die is run at the front of the press for some reason, or the loads are much off center, tilting of the slide front to back, or vice versa, must be avoided. This can be done by installing a large reservoir supplying air to the counterbalance cylinders and adjusting their respective pressures.

Die Design. To avoid exceeding the rated 150-ton capacity of our press, we must keep in mind certain facts about material and also learn how to divide up the load.

Dividing the load is a practical method, and must be arranged so that flywheel energy is removed in steps, or else we will absorb more than the permissible 20% of flywheel energy, thereby stalling the press.



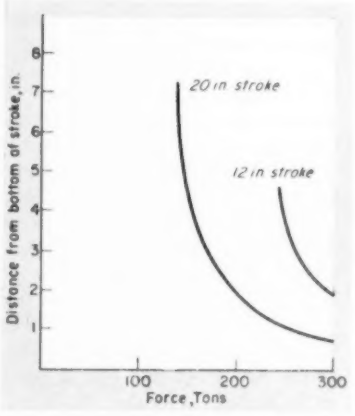
LOAD CENTER of a die or a die station is calculated from the law of moments

PRESS CHARACTERISTICS

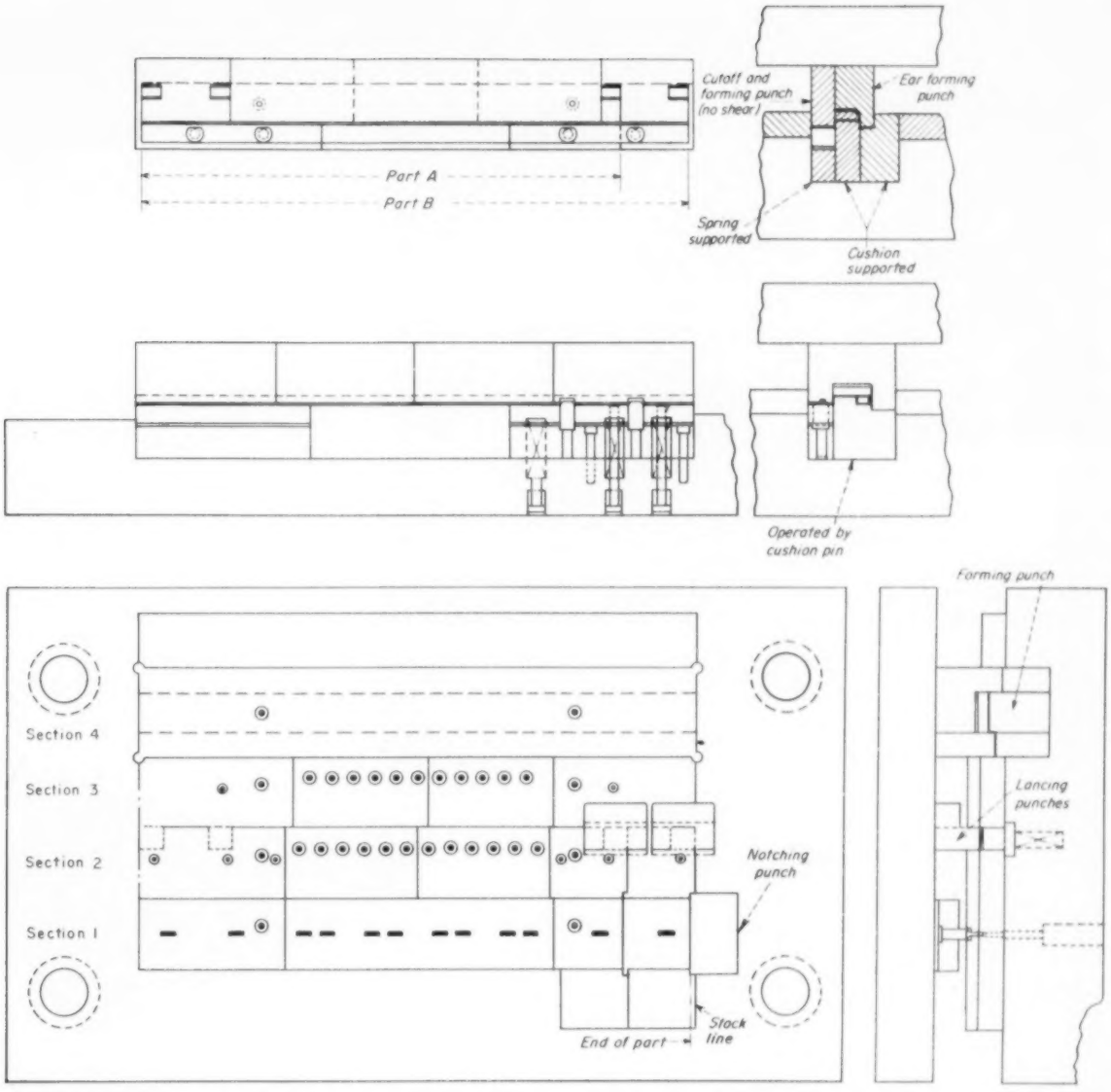
Ordinarily, a press is rated by the tonnage it will deliver at a point near the bottom of the stroke, say 1 in. above bottoming. Actually, a press of a given size, say 300 tons, can be supplied with any one of several strokes, depending on the throw of crankshaft used. If supplied with a 20 in. stroke, the press might deliver 300 tons at a point 1 in. above bottom of stroke. With a 12-in. stroke the press might deliver 300 tons at a point 2 in. above the bottom of stroke. However at a point 4 in. above bottom of stroke, the first press would deliver only 150 tons whereas the second machine could exert 250 tons.

If the press is run faster than rated speed, its effective tonnage must be reduced by a certain factor.

If speed and stroke can't be changed, the only way we have of getting more work out of a smaller press is to divide up the loads prop-



EFFECTIVE TONNAGE depends on the length of stroke of the press and the distance from the bottom of the stroke



PROGRESSIVE DIE for a channel makes rights and lefts, in two lengths. At fourth station, no shear can be used, because 0.050 in. lead-coated mild steel is cut off, then formed on an air cushion. After channel is shaped, punch forms the ears, as seen in section B-B. Load figures at 190 tons, neglecting cushion pressure. The job is actually running in a 150-ton press

erly between die stations, put enough energy into the flywheel, and take it out in steps, without at any time removing more than 20%. Modifications in shut height and flywheel are much less expensive than buying a large press.

PRESS-CAPACITY CALCULATIONS

Most blanking and forming operations use only a very small portion of the press stroke. Hence, to perform them, the flywheel must give up its energy in a very short interval. According to E V Crane in his book "The Plastic Working of Metals," (John Wiley & Sons), one can take up to 10% of flywheel energy without stalling the press, when the press is run continuously and 20% if it is run intermittently. The permissible energy dissipation on the 10% basis is:

$$E = \frac{\text{Rpm}^2 \times D^2 \times W}{5{,}250{,}000{,}000}$$

where E = inch-tons, D = flywheel diameter in in. at radius of gyration, and W = flywheel weight, lb.

For each die make a diagram showing the relative heights, or steps, of the punches at the various stations, and tabulate pressure and energy values as follows (an actual case):

Station	Tonnage	Slide Travel In.	Energy Needed In.-Tons
1	40	0.125	5
2	30	0.500	15
3	14	0.500	7
4	12	0.250	3
	96	5/8*	30

* Stations 2 and 3 are actuated together by die cushion.

Normally, the die designer would add the tonnages for the four stations, and assume the need for a press of 96 tons plus 25% as a safety factor, or a 125-ton or 150-ton machine.

But look at the maximum tonnage required at a given instant: 44 tons for stations 2 and 3, which act together. Add 10% to 18% for friction, depending on press de-

THE AUTHOR

EDMOND J JAMES is a long-time contributor to *AM*. Before the war he wrote on welding machines and fixtures at Packard, where he was chief welding engineer. During the war, he described tooling-up for the Vought Corsair at Goodyear, where he was manager of tooling and consultant. At Akron, Mr James applied automotive-tooling principles to dies, machines, and fixtures for Corsair parts to such good effect that the company was turning out 10 airplanes a day within a year after he started the planning work.

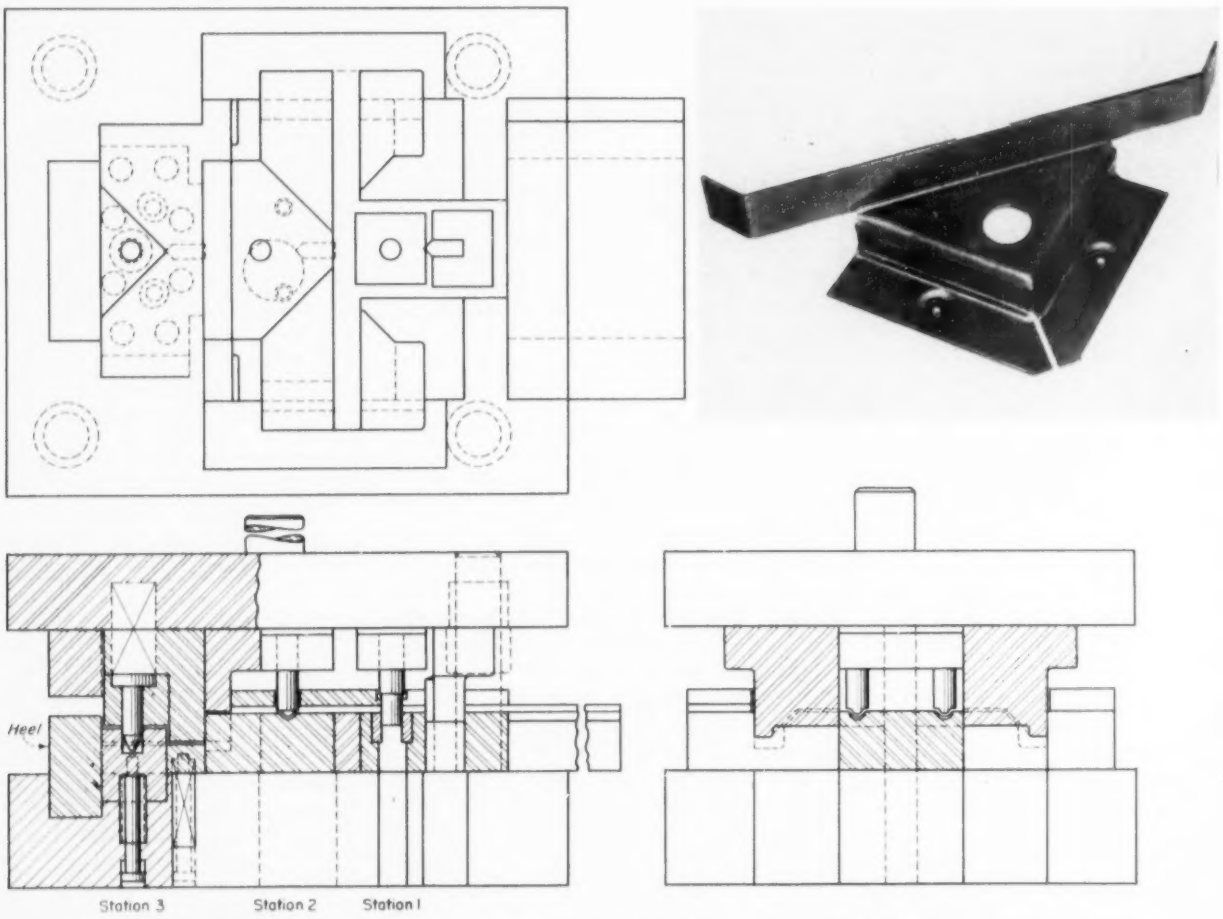
Mr James has had both technical and practical experience in all branches of tool engineering. He has worked as a tool and diemaker, special-machine designer, die-shop foreman, assistant master mechanic, and chief welding engineer. Automotive companies where he gained this experience are Ford, Briggs, Hudson, and Packard.

Since the war, the author of this Special Report has spent his time showing smaller manufacturers how automotive tooling and production methods can be applied in their plants at suprisingly low outlay, considering the cost savings and increased output realized.

sign or type. Assume 10% and get 48.4 tons, for the particular example. Refer to the tonnage vs. stroke curve for a 60-ton press and note that the tonnage available ¾ in. above bottom stroke is 50 tons. On this score, a 60-ton press can safely do the work. Steps on the die are then arranged at proper height above stroke bottom to provide sufficient tonnage.

What about flywheel energy? The total energy needed is 30 in.-tons. If a flywheel weighing 1350 lb and having D equal to 34 in. is run at 322 rpm, the value of E is about 31 in.-tons. Therefore, for a given press-frame size we can get a special flywheel and save going to a larger press.

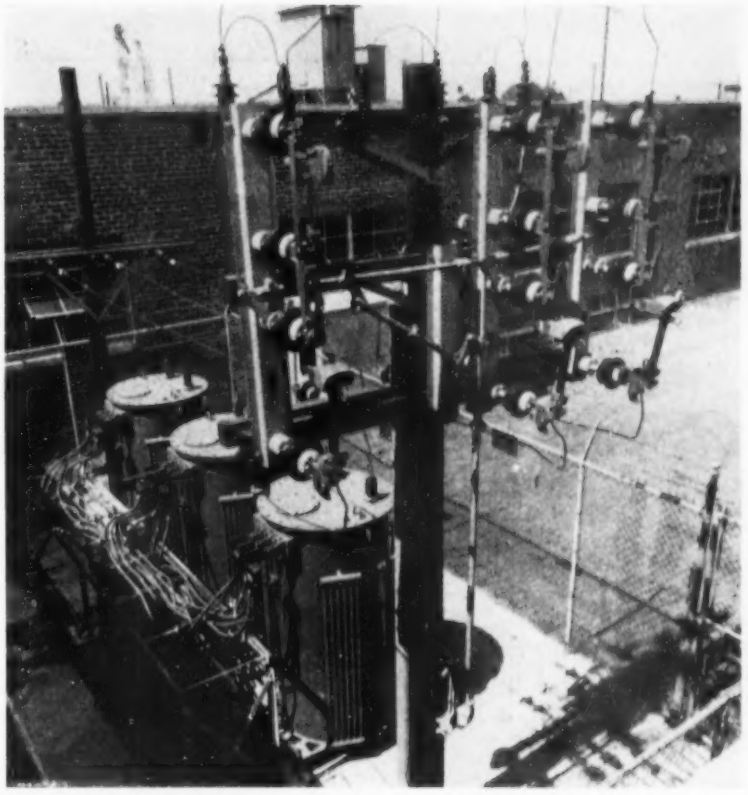
On some dies, as a further check, we may have to see that no one step is taking more energy from the flywheel than it can recover in the interval of press stroke prior to maximum pressure requirement at the next station. To determine this, we must relate the position of the slide to the angular displacement of the flywheel in radians. This subject will be discussed in a future article.



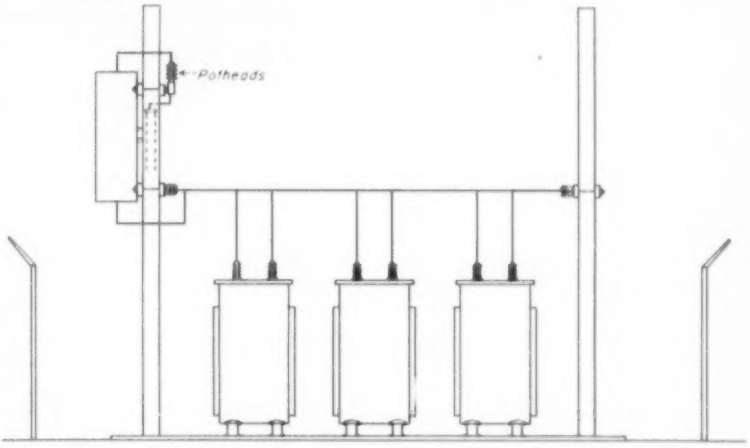
"CARRY-ALL" PROGRESSIVE DIE produces a severely formed piece in three steps. Die can be used in 60-ton press (see example under "Press-Capacity Calculation." Operations: station 1—pierce pilot hole, which later becomes bolt hole, pierce slot and notch ears; station 2—finish notch, preform the ears and half-spherical indentations; station 3—cut off and form over long portion of stroke

power facilities increased at small cost

To revamp a sheet-metal fabricating plant for higher production at lower cost, one must plan the power distribution facilities just as carefully as the installation of machinery and methods. Cost is usually a limiting factor. We had three 100-kv transformers connected delta-Y, a 1600-amp switch and C. T. cabinet, and about 150 ft of 600-amp bus duct. The electric equipment within the plant obviously should not be scrapped. Our problem then was to add capacity cheaply and to do it without interrupting production. By planning the job carefully, in conjunction with engineers of the Long Island Lighting Co, we were able to get the extra capacity at about one-third the normal cost.



THREE 333-KVA TRANSFORMERS now supply the power for over 450 ft of 3-phase, 236 v. bus duct within the plant. Single phase welders are divided among the three phases to balance the load



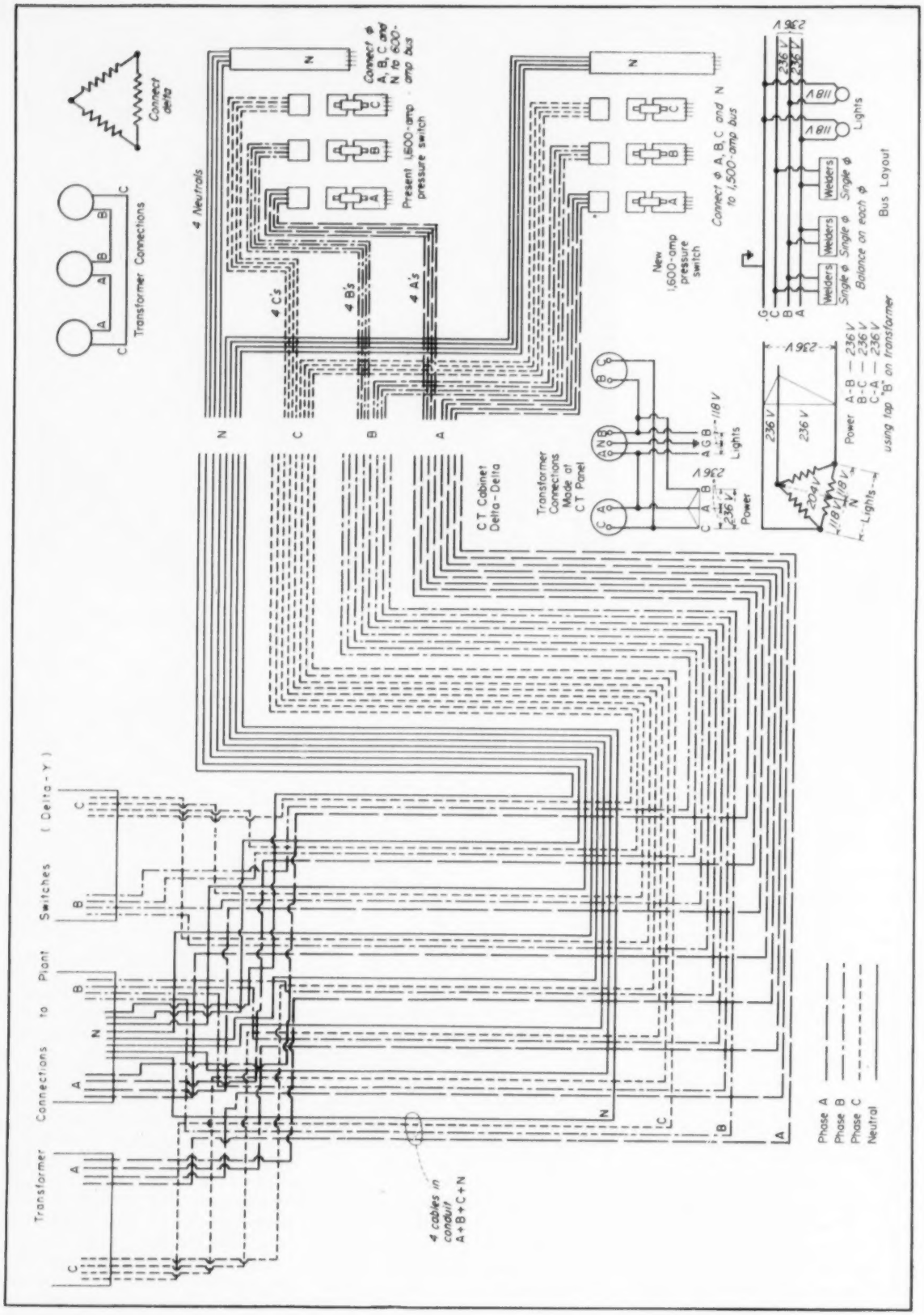
TRANSFORMERS are connected delta-Y. Eight conduits, each containing phases A, B, C and neutral, connect the transformer bank and the switch equipment inside the plant

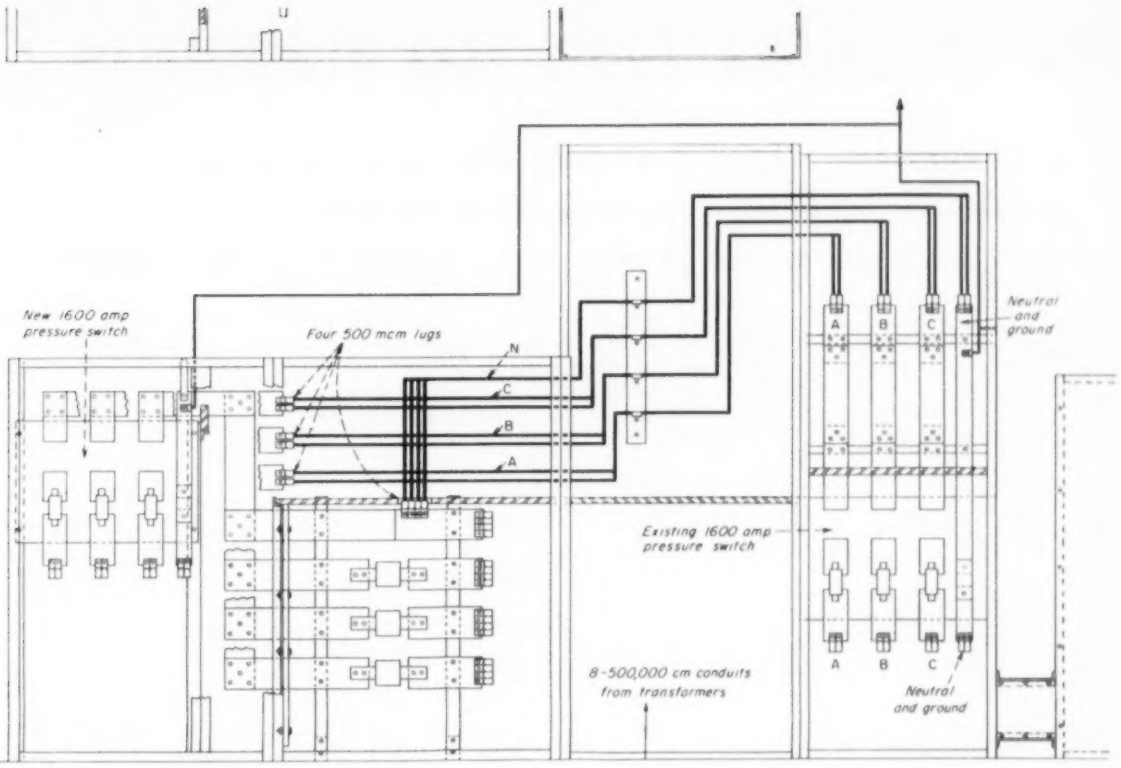
INRUSH REQUIREMENTS

To reduce costs and increase production, we proposed to change from spot welding to gun welding the cabinets and from arc welding the doors to flash welding. Single-phase equipment would be used at 220 v. Therefore, as the first step we calculated the inrush requirements. With a spot welder, the inrush current is 1 to 1½ times normal current, but with a gun welder the inrush current is 3 to 4 times normal current. This characteristic arises because of the greater inductance of the secondary loop consisting of the deeper gun throat and long flexible leads. These inrush currents totaled 600 kva. On the basis of the inrush requirements, we selected three 333-kva transformers, a total of 999 kva.

The economies in our setup were realized by departing from the ordinary practice of supplying enough copper in the secondary bus to cope with total momentary inrush. We applied the system used at the Packard Motor Car Co, except that instead of a concentric secondary single-phase bus, Metalab employs all three phases and the equipment is divided among them. The lighting circuit is separate from the welding circuits, avoiding flicker on power company lines. Each machine or welder is connected to its bus by a fused disconnect switch. Electrical failure at any machine will not interrupt power to other machines.

Grouping of machines by phases saves copper and allows the use of a smaller bus. This is a practical solution for the smaller plant, because it is virtually impossible for all welding guns in a plant to fire at the same instant. In fact, from experience on 20 consulting jobs, when calculating bus capacity I have found it entirely safe to divide the total inrush requirements of single-phase equipment by 3 or 3 1/3, depending on the number of


Connect delta
Transformer Connections
4 Neutrals
Present 1,600-amp pressure switch
Connect ϕ A, B, C and N to 600-amp bus
4 C's
4 B's
4 A's
New 1,600-amp pressure switch
Connect ϕ A, B, C and N to 1,500-amp bus
Lights
Welders
Single ϕ
Balance on each ϕ
Bus Layout
CT Cabinet Delta-Delta
Transformer Connections Made at CT Panel
Lights
Power
A-B — 236 V
B-C — 236 V
C-A — 236 V
using tap "B" on transformer
Transformer Connections to Plant Switches (Delta-Y)
4 cables in conduit A+B+C+N
Phase A
Phase B
Phase C
Neutral



ONE CT CABINET supplies two 1600-amp pressure switches. Total switch capacity of 3200 amp as compared to 2100-amp plant load means that switches run cool. Delta-delta connection at CT cabinet means that loads can be balanced on phases. Thereby bus copper and switch capacity required are reduced over normal electrical installation procedure

flash welders, which draw more current.

To select switches, when using single-phase welders, I have found it necessary to total the rated capacities, as established by the Resistance Welders Mfgrs Assn. We already had one 1600-amp switch connected to the existing 600-amp bus. Another 1600-amp switch was connected to the 1500-amp bus laid into the plant. Therefore, we now have switch capacity of 3200 amp, against total bus capacity of 2100 amp. Excess switch capacity over demand makes for cool operating switches.

For the electrical or welding engineer, we can explain how copper was saved. We departed from the commonly used delta-Y connection of the three-phase bus and changed to delta-delta. If we had retained the delta-Y connection, we would have had to increase the size of the switches and the secondary copper. Other disadvantages of the usual arrangement are: light flicker could not be avoided, unless we added a separate transformer for lights, balancing the load on the three phases would have been a problem, and the cost would have been excessive for this size plant. But our system provides 236v on A, B or C phases with only a 1½ v drop at the end of the 268-ft. bus. The same 1500-amp bus is used for lighting circuits; we can use either A or B to neutral. Therefore, we can divide the lighting circuits to avoid plant shutdowns from lack of illumination caused by failure of one leg of the circuit. This bus was built along with the CT cabinet by Westinghouse Corp to our specifications.

Transformer connections are A to A, B to B and C to C. Eight 4½ in. conduits are connected from service heads to the meter cabinets. Each conduit contains an A, B, C and neutral. When brought out of the conduits, the cables are delta-connected at the switches.

To avoid production interruptions, the new transformers were moved into the yard, and an approved manhole was built. Poles were erected at each end of the transformer pad. One pole mounts the interrupter switch, lightning arresters, the primary potheads and 13,500 v high-potential lines for the primary side of the transformers. This station with its interrupter switch and transformers are grounded.

With the new panel equipment and bus in place, and the extra conduits from meter inclosures to transformer station installed, the existing current transformers were removed from the CT cabinet and bussed across by ½ × 4-in. copper to switch. Thus, both switches were supplied through one CT cabinet. The only work remaining was to splice to the new power company lines in the manhole. For this purpose, a 15000v primary conduit had been installed between transformers and the manhole. Mix-ups within the plant were avoided by color coding the 500 M, cir mil secondary cables used in place of copper bus.

are machine tools too elaborate?

A WEST COAST READER SAYS THEY ARE, ***from his point of view... so we asked several lathe builders for their opinions. Basically, their answer is...***

"WE CAN MAKE SIMPLE LATHES, BUT...WOULD YOU BUY THEM?"

From time to time, we hear the criticism from users that "machine tools are too expensive" and that "they are too elaborate—a simple machine would cost less and do as well." This letter is unusual in that Mr Moulton permits quotation. While he has a specific market in mind, his remarks can readily be generalized to bear on the basic question. Here's his letter:

the problem...

The Pasadena, California, area is noted for its facilities for the manufacturing of precision instruments and experimental equipment. I have been closely associated with this type of work in this area for the past ten years and have seen its capacity increase by a factor of four or five. In my present position, I am responsible for the subcontracting of many thousands of dollars per year of instrument and precision experimental work connected with the jet-propulsion field. Ninety percent of the work is one-of-a-kind, also is difficult to machine, with tolerances considerably smaller than ordinary. Materials range from the most common to the most exotic types of alloys.

The type of concerns we have been able to deal with most successfully are small shops employing from three to 25 people. It has been our experience that close liaison with the foreman and the men on the machines will give us more accurate and better work at lower costs than is possible in larger firms where personal contacts are difficult to achieve. These small shops have equipment which ranges from the most modern to practically antique. They are invariably operated by men with a considerable quota of initiative and mechanical ingenuity who welcome new and difficult problems.

The purpose of this explanation is to point out to you (and to your readers if you choose) that the newness of the equipment, the horsepower available at the spindle, the modernness of the surroundings, have no influence on either the ability of a shop to produce close-tolerance research equipment or on its final cost. This is a sweeping statement, but I am fully prepared to prove my point. Actually, the shops producing some of our finest work are equipped with belt-driven lathes, milling machines of low horsepower, toolpost grinding equipment, and without a single tool representing an investment by its present owner of over $4,000. Such a shop, by putting these machines in topnotch working condition, and by employing the best available mechanics,

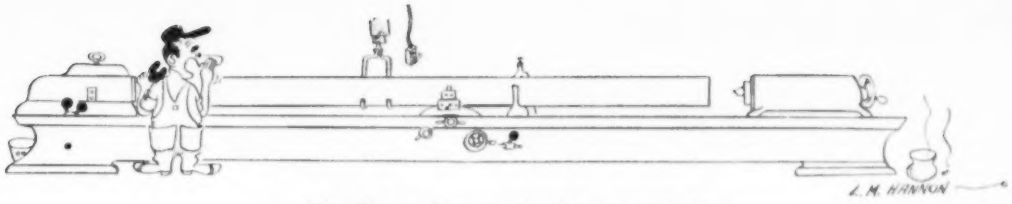
"Contains iron, stainless steel, copper, brass, chromium, magnesium, lead, molybdenum and artificial coloring."

can produce one-of-a-kind instruments and research apparatus at a lower cost than a similar shop with the best and most modern equipment. I do not claim than they can produce it in a smaller number of man hours, but operating overhead plays a large part in determining final costs and this is where the shop with modern expensive equipment loses out.

For example, let us take a small low-tolerance piston for a special valve which requires turning, chrome plating, and finish grinding. The shop with modern equipment will turn it on a $7000 9-in. toolmaker's lathe in approximately two hours. After plating, it will be ground in a $10,000 small precision universal grinder in approximately 20 min. The other type of shop would put it in a $600 belt-driven 9-in. bench lathe and turn it in three hours and after plating would grind it in the same lathe with a $100 toolpost grinder in 30 min. The first shop's rate is $7 per hour and the second shop's rate is $4.50 per hour. The pintle costs $16.31 in the modern shop and $15.75 in the other. Other cases are even more clearly cut than the example quoted.

PRICING OUT OF THE MARKET?

This brings up several points for modern machine-tool manufacturers to consider: First, they are pricing themselves out of this market. On work of an experimental nature, speeds, feeds, depths of cuts



"Hey, Chester, throw my tailstock in again, willya?"

and horsepower available influence only the time required to take the first few roughing cuts. The ability of a machine tool to utilize carbide is of little value where little time is required for the roughing work and where special form tools are the rule rather than the exception. After roughing is complete, a well-tuned ¾-hp belt-driven lathe is equal to a $7000 5-hp geared-head lathe as far as time and accuracy are concerned and is frequently superior in surface finish. Other factors currently in favor of low-powered tools is the absence of heat generated in the workpiece and low deflections because of low tool pressures. The heat problem can be partially defeated with the use of coolant except that in this type of work unobscured vision of what is happening at the cutting tool is of even higher importance so that cutting fluids are rarely used. The problem of workpiece deflections from tool pressures has no ready solution.

It is my opinion that machine-tool manufacturers should take a fresh look at the field of machining of single-piece experimental equipment and attempt to design tools for this purpose. Such tools need not have the rigid, rugged design and high horsepowers necessary for high-production carbide tools and they should not be saddled with the costs of these features. What I look for in purchasing tools for our own shop are features which will minimize vibration, increase versatility, give high accuracy, and low maintenance and initial costs. Too frequently, in order to get the most-desirable features, we are forced to buy tools with double the mass of steel castings and horsepower actually required.

NEEDS HIGH ACCURACY

At present, the most accurate tools available are also the highest powered and highest priced. Is it asking too much for a machine-tool manufacturer to put out a really precise 12-in., 1-hp, lathe, belt-driven, with hardened ways, lapped precision lead and crossfeed screws, for $3000 to $4000? The same design criteria can also be equally well applied to millers, shapers, grinders and other general-purpose tools.

Modern tools, in my opinion, are too frequently designed using stress-analysis methods of 50 years ago. It seems to me that the latest school of thought is that if a machine doesn't look big or rugged enough, pour a couple more tons of cast iron in the base, knees, saddle, column, or what have you. I think it is time for machine-tool designers to take a good look at an aircraft structure and the materials from which it is constructed. I am not proposing that machine tools be constructed in a similar fashion, but I definitely do propose using a piece of 0.093-in. aluminum where it will provide the required strength and rigidity in place of the ½-in. thick casting currently in use. If additional weight is required to reduce the amplitude of vibrations and to increase rigidity, why not design a cavity in the machine base into which the purchaser could pour his own reinforced concrete? After all, besides having the necessary mass, it is a pretty good structural material and considerably cheaper than cast iron. In many locations, it could be poured at a lower cost than the shipping charges on the cast iron it replaces.

It is my considered opinion that machine-tool manufacturers should survey this field and offer it a line of tools of low power, low weight, high accuracy and low costs.

R E Moulton, *Manager*
Fabrication Services
Jet Propulsion Laboratory
California Institute of Technology

sales are the criterion...

Basically, the builder's problem has been that of the blind man who came into a bar offering to identify by taste alone any whiskey offered him. After he'd named two or three successfully, the bartender offered a shot glass containing only dishwater. The blind man tasted, spat it out, and exclaimed: "You've got me on this one. I don't know what it is, but I'm sure of one thing—it will never sell!"

Mr Moulton makes some interesting points, including that of a concrete-filled bed. Older readers will undoubtedly recall the suggestion of Lucien Yeomans during World War I that emergency planers be produced by laying rails on a concrete bed. There have also been several recent designs of lathes for shipboard use that made use of fabricated bases and special mountings to withstand racking of the hull, and various other modifications. Basically, however, the lathe is still a cast-iron structure for rigidity and stability. But let's allow the builders their own replies. Extracts from typical letters appear on following pages.

lathe could be built but...

Says one builder: First of all, it would be possible to manufacture a lathe such as Mr Moulton describes, in a small shop with low overhead. If a person with experience has charge of a plant employing 75 people, or even more, it is possible to conduct a machine-tool plant with amazing economy. First of all, the output would be confined to one size and a good man could be general manager, treasurer, as well as plant superintendent. He would not need production control because everything is under this man's thumb. With a small organization, it is possible for a good leader to inject into these few men a pride of workmanship and accomplishment, and a very good product can be built without inspection. Overhead would be considerably less than 100% of productive labor. Of course, no experimental or development work would be attempted and as a result no contributions would be made to the industry or to the art of machining. This type of organization lives off of the developments of others.

The first difficulty arises in the marketing of a product of this kind, because the line would be confined to a single or maybe two sizes. It would be almost impossible to get representation, as none of the reputable lathe builders would permit his dealer to handle his line, and the dealer who has the problem of selling all sizes cannot afford to ignore the desires of the larger manufacturer.

BROAD MARKET THE AIM

All of us have frequently heard the many remarks of users and others of the desirability of having more simple and economical machines. Whenever a machine tool is designed, the manufacturer is working for the broadest market that he can get, fully realizing that he will also secure some business from some types of shops that could well use less-elaborate types of lathes. It would be possible, if we were to design a simple machine for making a small piston or pintle, and we could find a successful market, that we could produce a high-quality machine at low cost.

Unfortunately, people do not want to buy this type of machine. First of all, on a small lathe they want good accuracy that will stay in the machine for a number of years and with a minimum of down-time. They want a very complete range of spindle speeds that will permit them to do accurate turning with a good finish on small diameters, yet they occasionally want to use a form tool which requires some power and in all probability they will want to chase metric and module pitches. Regardless of what people may say, they do not want a three- or four-step cone drive with back gears and they will certainly insist on a quick-change gearbox. You only have to interview a used-machinery dealer to find this out.

I think you will find that the most successful machine-tool builders are those who can determine what a customer wants, what he is willing to pay,

"Is that all you can say—it worked all right on paper?"

then give him exactly that kind of a package. In selecting a machine tool for a plant, we could throw our judgment to the winds and rely on figures given to us by our cost clerks and come up with the answers suggested by Mr Moulton. I can just see some prexy, who has come up from the accounting or legal side of a business, call in the manufacturing vice president with an "I told you so" attitude, and proudly inform him that he knew all along that high-priced machine tools were not at all necessary. Fortunately for us, successful management consists of more than putting into execution a cost-clerk's recommendations.

I can cite numerous instances in which certain features on machine tools do not have an economic value, as far as time study and cost work is concerned. Let us take as a first example a Cincinnati dial-type milling machine. We have several dozen in our plant and many were bought in the recent past and we will continue to buy them, but many times a 6-in. face mill is placed on one of these milling machines and the spindle will revolve at exactly the same number of rpm's for several days. Yet the manufacturer has seen fit to provide a speed-changing mechanism, which obviously costs considerable money, and it is accomplished by merely pressing one lever. Any good cost clerk can quickly point out that this does not pay.

Let us discuss the rapid traverse to the head of

"Didn't you say there were some bugs in this machine?"

any of the good radial drills manufactured in this country or abroad. You can have the best time-study man time and operate the spindle from one hole to another by using the hand wheel or by using the traverse. I'll bet you cannot prove that it pays to buy this traverse.

Still another example. Many planers have jobs on them that last for several days and during that time the rail is never moved. Yet if you will check with either Gray or Giddings & Lewis you will find that practically all planers are sold with power clamping and power elevation to the rail. Further if we had a Gray planer with the reversing belt drive, wholly written off of our books although in good condition, I will wager a pretty penny that you cannot figure that it is worth buying a new variable-voltage drive with all modern features. Most any cost man will point out that the current required for reversal and traverse, the amount of down time for setup, the excessive investment, are simply impractical and that the breakage of carbide tools make their use prohibitive.

The American public is daily buying thousands of different things and is more interested in the features than the economic value. I will make a guess that your car has an automatic shift and you probably have power braking and power steering. You could not prove the economic value of a power lawn mower, a coffee grinder or a food mixer. Yet there are many people manufacturing these labor-saving devices and when you get right down to it they do no more than provide more time for leisure or plain loafing, if you please.

Many manufacturers buy machine tools as a matter of pride of ownership, to keep labor satisfied, to reduce fatigue, to instill in the mind of an operator good care and maintenance, and for many other reasons that cannot carry a dollar sign.

Says another builder: If one did not have to consider markets and built machine tools one at a time, the simplified machine would be just ducky. However, the world is not constructed that way.

Furthermore, Mr Moulton totally ignores the fact that a machine and its operator are a team and in order to get the kind of results that he wants, you have to have one whale of a good operator. It goes without saying that the number of good operators left on this planet is very very small indeed.

I have personally done a lot of work with subcontractors in alley shops such as he describes. I know how they work and know the reason they get by is the men on the machine, not the machine.

It has not been so long ago that one of the machine-tool dealers of prominence in the United States lost his milling-machine account; so he came up with this idea: Wasn't it a swell time to get hold of a simple milling machine without frills that could be sold at a price? He undertook to do this for a year and it was a miserable failure. Nobody wanted that kind of a machine.

machine and man are a team...

"I can't fire him; he's rewired the machine so nobody else knows how to turn it on."

---

overlooked two points...

Says a third: I see nothing particularly wrong with his criticism, nor in his method of analysis. I think that he and I could have a very interesting discussion on the subject. I might dispute some of his points and ask him to clarify some of them.

I do feel that there are two major points which he has overlooked in arriving at his conclusions:

1. I believe he has overlooked the human element. These two- and three-man shops are generally started and run by men with extremely high mechanical skills. Their engineering education might not be what you would find in superintendents or plant managers of larger organizations, but they have very high natural mechanical aptitudes. In addition to this, they have a highly developed sense of individuality and independence. It is the combination of these abilities which have made them get out of the shops where they were working and start their own businesses.

In order to compete successfully, they use all of these skills in machining most quickly the single-piece jobs which are brought to them and are thoroughly versed in proper preparation of their cutting tools in order to stay within the horsepower of the machines they have available. Their mechanical abilities are also used to keep the machines in operating condition by making numerous small repairs in their spare time. This a large company could not put up with.

2. He also overlooks a point of economics. The machine-tool builder, to stay in business, must actively maintain his contacts and design his products

to the requirements of the most active potential customers. As in any other field, the customer dictates the type of product for which he will spend his money. It is only by keeping in close touch with the active purchasers that we know what they want and change our designs in accordance with their wishes.

The small tool shop constitutes the second-hand market towards which older or obsolete machine tools gravitate. Both new and used markets are necessary to keep the machine-tool industry going.

I do not know if Mr Moulton uses new automobiles or buys his transportation in the used-car market. If he were to think seriously of the economics of the problem he would see how closely the machine-tool problem is related to the automobile business.

weight is not costly...

A fourth builder adds: There is no question but what the small shop is the best place to subcontract precision experimental work; neither is there much question but what the accuracy of the work and the cost depend more upon the man than upon the machine.

But I cannot see that he has put forth a conclusive argument for machine-tool manufacturers to come out with different types of machines than they are already building.

Surely he knows about the products of such concerns as: Hardinge who builds 9-inch lathes at prices all the way from $1375 to $4235; South Bend, who builds all kinds of small lathes at moderate prices; Cincinnati Lathe & Tool Company, who builds a very fine 13 x 24-in. lathe at a maximum price of approximately $2000; and Rivett, who builds a 12½ x 20-in. precision toolroom lathe for $9000.

Mr Moulton seems to emphasize a lightweight lathe, drawing the inference that weight is expensive. Of course it isn't, and, in addition, it would be difficult to get precision and rigidity with the type of construction he seems to advocate.

It is extremely doubtful that there would be a sufficient market for machine tools designed expressly for experimental equipment. However, it would be comparatively simple for present small lathe manufacturers, for an extra price, to put the necessary precision into their standard products.

on light-duty lathes...

Here is a letter in rebuttal, from a maker of light-duty lathes:

To take care of Mr Moulton and other critics unwilling to be quoted, it will only be necessary for you to mail them a bulletin and quotation sheet on our precision toolroom lathe. Unfortunately for Mr Moulton and others, delivery on our toolroom lathe is approximately two years.

"The engineering department is closed down today, now who are we going to blame this mistake on?"

We agree with everything Mr Moulton says with the exception, 'The most accurate tools available are also the highest-powered and highest-priced.' All of our machines employ ¾-hp motors, with the exception of the toolroom lathe and chucking machine, which employs a 1-hp motor.

Further, our machine tools are designed with the rigid, rugged design and have the required power to use the high-production carbide tools. They also minimize vibration, increase versatility, have the high accuracy, the low maintenance and initial costs which Mr Moulton specifies.

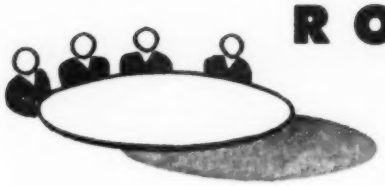
to sum up...

Obviously, no machine-tool builder can fly in the face of demand—he must produce machines that satisfy requirements of the largest potential market. The one-of-a-kind shop and the small job shop are *not* quantity purchasers, and each would have its own ideas, resulting in costly custom building.

Besides, there is the basic urge of the craftsman for a top-quality machine—and of the American for gadgets. As one of our discussors mentions, we are adding automatic shifts, power steering, air conditioning and the like to automobiles already loaded with what Europeans consider as "gadgets." But do the buyers stand back and refuse them? No!

The same goes for machine tools. As we said a year ago in our 75th Anniversary Number, in discussing tracer control, duplicators, tape control, and infinitely variable feeds and speeds:

"There are, and always will be, those who contend that all these things are 'gadgets' and that they make a machine tool too expensive. Yet builders who have brought out 'stripped' models at reduced prices have not been successful with them; buyers are always fearful that features not now needed will be required eventually. After all, 20 years ago, rapid traverse, centralized lubrication, built-in coolant systems, full speed ranges, simplified controls, and the like were 'gadgets.' Who is willing to do without them today? And builders now feel that eliminating them would save so little that most buyers wouldn't be impressed."



ROUND TABLE

Toolroom or Schoolroom?

"I see you're using Barrett on that combination die, Ed. You don't mind taking a chance, do you?"

"Who's taking a chance, Al? Barrett is supposed to be a qualified diemaker. He certainly had good recommendations from his old job at Davis."

"Yeah, Ed. He had recommendations, but he only worked there two years. Why don't you give the job to Miller? At least you know Miller won't foul up the job. He's an experienced man."

"Now what's all this talk, Al? Here I've got a dozen or so good die men, and you want me to overwork the guy who's been here longest. Just because he's an old hand doesn't mean Miller is the only man who can handle a job."

"But how do you know Barrett can handle the job? After all, it's a tough one. Even Miller has had trouble with that kind of die, Ed. Of course this isn't my business, but I can't see not taking advantage of the best you have, and Barrett certainly isn't the best. Just remember what he did to that cam die last month."

"Well, you're right about that, Al; but what of it? Barrett has got to learn some time, and now's as good a time as any. I can't afford to have a diemaker around who's a weak sister. I think all Barrett needs is some experience with our kind of work."

"And you have to nursemaid him all through the job. Seems to me you're asking for trouble, Ed. You'll be spending all your time watching the job and all the rest of your work slides."

"No it won't, Al. He's on his own, and if he fouls up he'll get the same treatment as anyone else who isn't capable. Actually, this kind of a long lonesome job is good training for a diemaker. It makes him think and work hard. By the time he's through, Barrett will be as ready for more jobs like that as Miller is."

"What are you running, Ed, a training school? I just hate to see you waste so much time and material on a man who isn't proven."

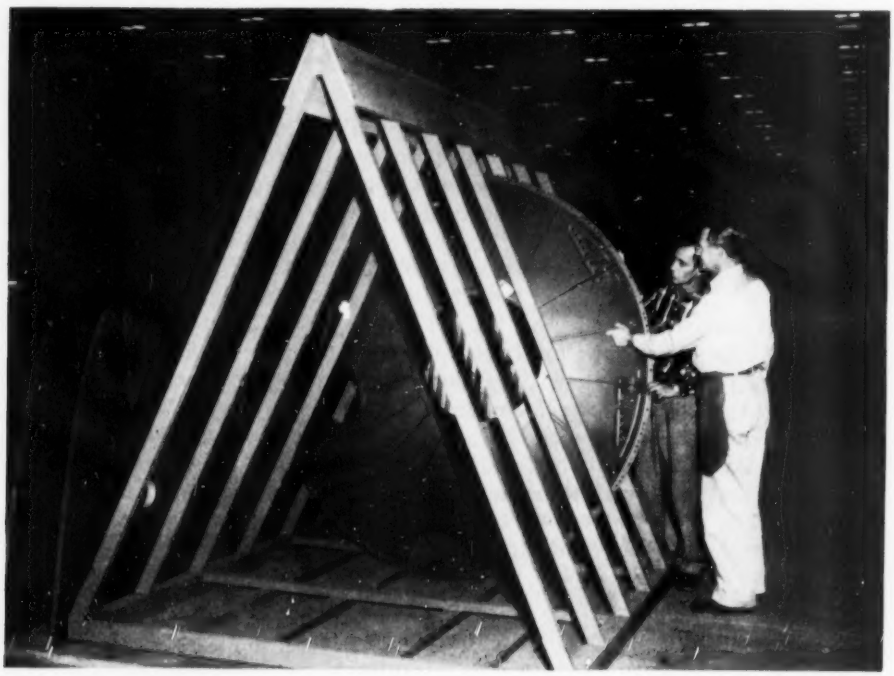
"Maybe there's a little schooling in every tough job, Al. The best way to learn is by doing the work yourself; not watching someone else do it."

"Well, it's your show, Ed, but I just wouldn't take a chance like that in my own department. I've seen too many jobs ruined by overrated bums who thought they were good mechanics, but who got lost when the time came for real thinking."

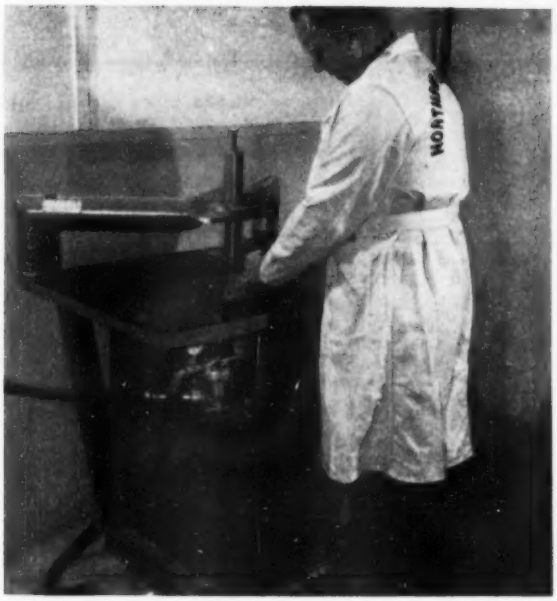
***HOW MUCH** of the company's time and material can Ed afford to bet on Barrett? Is Al right in taking a conservative attitude, or is he showing too little confidence in a man that's rated for his job? Your opinion on this subject may help others with like problems. Discussions of earlier topics appear on later pages.*

SHOP SHOTS

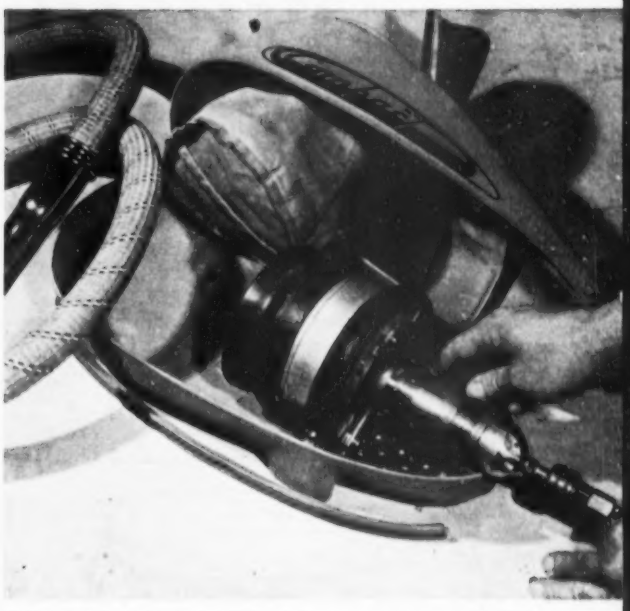
$14,000 ROLL-ELECTRODE WELDER seams 3-in.-dia support bosses in fuel manifolds for J-47 engine assemblies. Instead of being fixed, with work being moved, roll is pivoted and powered to rotate in a circular path. Upper electrode carries 14,000 amps through ½-in. shaft and floating joint. Lower electrode is a clamping fixture that grips the tubing inside the manifold. Special planetary-geared tooling for this job can be removed and standard seamwelding equipment inserted in 30 min. *Solar Aircraft Co*



WOOD STORAGE RACK for pressure bulkheads concentrates parts in smaller space than vertical stacking, which is limited by danger of damage to parts. Bulkheads are for C-97 *Stratofreighters;* are 7 ft in dia and have dished shape. *Ryan Aeronautical Co*

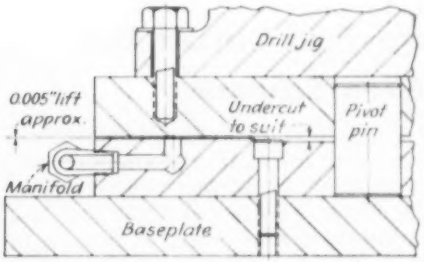


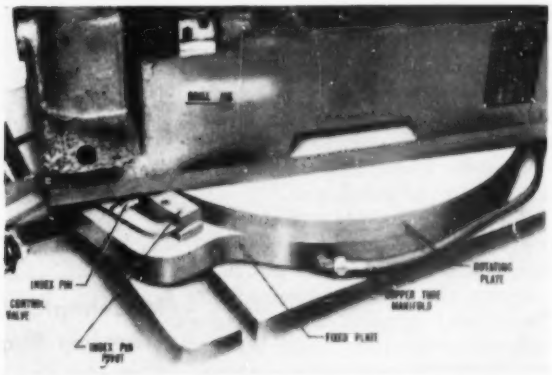
TEMPLET DUPLICATER speeds up production of sheet-metal parts by cutting duplicate templets from the master faster. Roughed templet is fastened to master with handles and spacers, then master is pressed against guide pin of pin router while templet is profiled by carbide cutter under guide pin. Air-operated pedal raises and lowers guide pin so cutter can work in cutout areas. Overarm of machine carries ¼-in. pin with tapered wedge that keeps templet separated from master. *Northrup Aircraft Co*



EXPLOSION-PROOF VACUUM CLEANER was made from household model by substituting pneumatic motor for electric unit. Only fabrication necessary was making twin aluminum-alloy fans and two baffle plates. Cleaner has much less weight and bulk than industrial explosion-proof cleaners; still is safe inside fueled aircraft. *Northrup Aircraft Co*

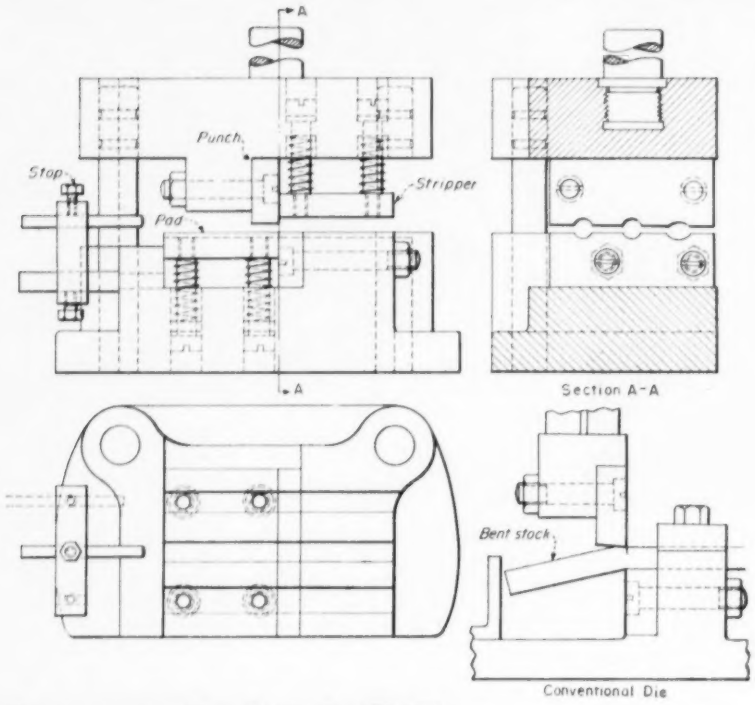
CARRYING RACKS for 15-ft C-97 longerons replace old method of moving the parts by manifold boxes. Six units can be moved easier, taking up only slightly more space than a single longeron by the older method. *Ryan Aeronautical Co*





AIR BEARING SUPPORTS INDEXING TABLE of 200-lb drill jig. Results are easy operation of table by women and less bearing cost, particularly for heavy jigs. Air comes through manual valve and copper manifold at 90 psi, escapes from under bearing plate at 45 psi, which raises plate 0.005 in. Lifting force is aided by normal machined grooves on surface of bearing plates, which tend to trap air slightly. Only danger is from chips, which are kept out by felt wipers. *Solar Aircraft Co*

Practical Ideas



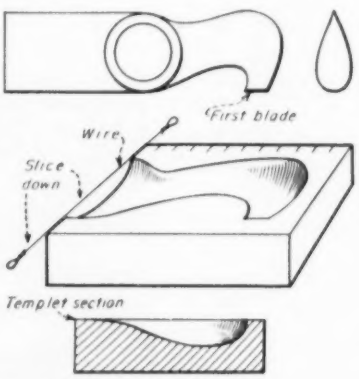
Pressure-Pad Cutoff Die Clips Wire Square

Many punches and dies for cutting lengths of steel wire are designed like the one shown at A; but this design doesn't insure a square cutoff. Because the wire is not supported at the end, it is bent down by the punch during cutoff to produce a slanted edge or bent tip, sometimes both.

A wire-cutting job in our shop was held up because of this problem. We wanted the ends of the wire square to eliminate a second operation. Therefore, we designed the illustrated punch and die.

Two spring-loaded pressure pads are included; one being the stripper, and one behind the punch to support the wire during cutoff. Four bolts support the pressure pad, which, in turn, holds up under the wire until the punch actually starts cutting and forces the severed piece of wire downward behind the die. With this tooling, the wire must drop while in a horizontal alignment, which insures a square cut.

The punch for this set is formed to handle round, square, or oval wire, and handles many odd jobs. *Hjalmar Dahl, Uplands Vasby, Sweden.*

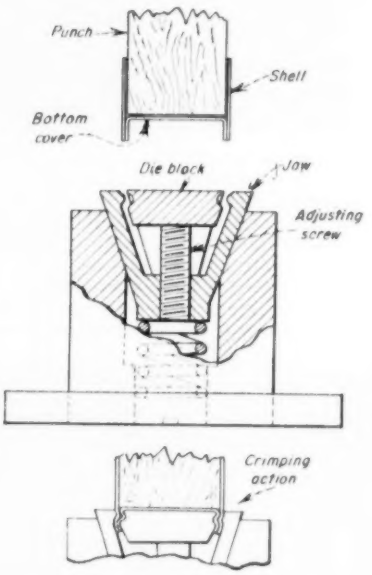


Modeling-Clay Templet Transfers Blade Shape

This was an experimental water-pump propeller of original design. The shape was worked out on one blade of the propeller, and we wanted to transfer the shape to the other blade without extensive equipment.

First we took modeling clay and pressed the formed blade into it. Then we took a piece of wire and sliced the clay model vertically, being careful to keep the parting line perpendicular to the datum surface. The clay was water-soluble, and hardened after a while. When hard, we had several templet shapes with which to check the second blade as it was being shaped.

This system can be used for any similar kind of work, and is easy and economical. *George H Griffith, Elmhurst, Ill.*



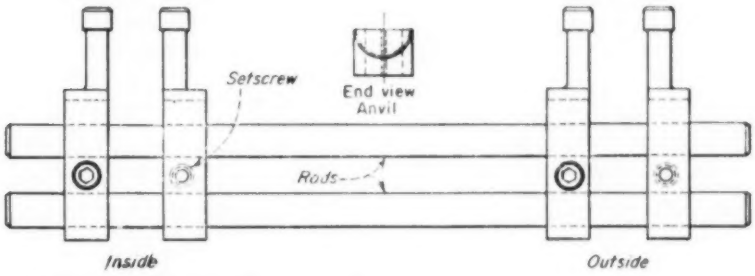
Curling Die & Wood Punch

A press-punch curling die for assembling bottom covers for smokepowder shells has been operated more than 10,000 times.

The punch is a cylindrical piece of hard wood. The shell and bottom cover are put together, then shoved onto the punch. The ram stroke forces the assembly down into the punch against spring pressure, and the jaws close on the die block, curling the shell and cover.

Die action is like that on a collet, with the jaws moving in to jam against the work and into the groove in the die block. The result is the same as produced by a curling roller.

The load this joint will take is 20 lb, which is five times that necessary. Material is 2S soft aluminum sheet. *T H Hsu, Taichung, Taiwan.*



Adjustable Snap Gage Checks Inside and Outside

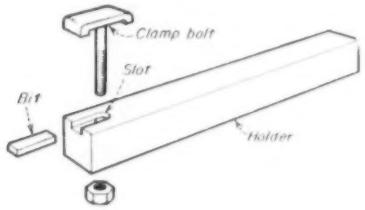
This is a gage I designed and made some time ago, and one which is now used, to my knowledge, in several plants. It can be set to gage an ID at one end, and an OD at the other; and is especially useful for small lots and short runs where gaging must be simple. It is set with standard gage blocks to the dimensions required.

The rods are ⅜-in. stock about 8 in. long, chamfered both ends, and oil-hardened and drawn to 60 R. or so. Two are required.

The anvils are rectangular blocks ⅝ by ½ by 2½ in., heat-treated the same way, and with the half-round anvil ends ground to a 5/16-in. dia. The slots and two holes allow mounting these anvils on the rods and clamping them tightly with a setscrew or small capscrew.

Care must be taken to make everything square and accurate, because precision of the gage depends partly on alignment of the anvils and rods, and this depends on accuracy of machining and fitting.

The gage should be capable of high-quality checking if it is well made. *Ray Gentry, Anderson, Ind.*



Small-Toolbit Holder

Standard carbide bits, ground to various tip shapes for special jobs, are inserted in this holder for lathe work. The bits are 1/16 by 5/32 by ⅝ in.

The holder is a fairly large piece of tough steel, and is drilled and milled to take the bit in a slot; clamped by a bolt whose head is counterbored so pressure will be concentrated close to the edge of the holder. A hex nut under the holder locks the bolt.

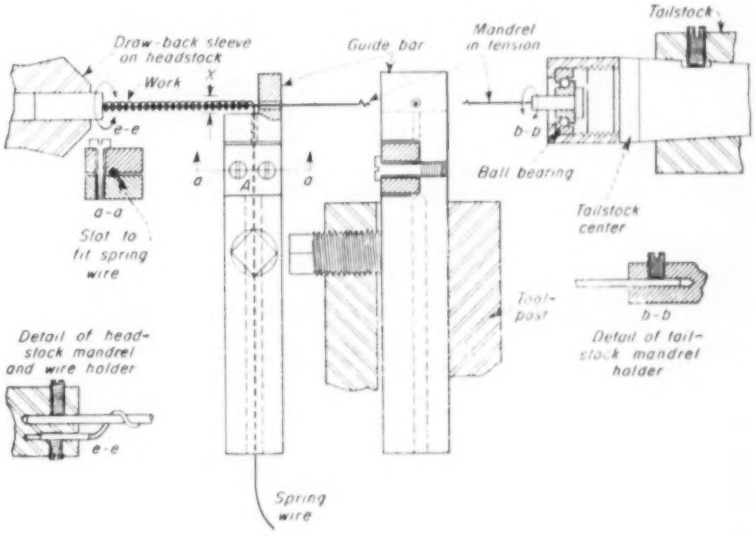
The bolt head—or clamp—is a rectangular block, made by cutting down a bolt or by welding the block to a lathe-turned and threaded rod.

Carbide bits should be stored in a grooved wooden rack, preferably of the sliding drawer design, to protect them from chipping and similar breakage. *Milton E Johnson, Port Chester, N. Y.*

Combined Welding Tool

If you take your welding hammer, cut off one tang, and assemble a steel brush (without handle) as illustrated, you have a good tool that is more easily portable for field welding work.

The best way to add the brush is to weld a steel slide or clamp to the hammer, then add the brush—which can be replaced when worn. The peening hammer is still useful, and is easily carried. *Haim Murro, Bayonne, N. J.*

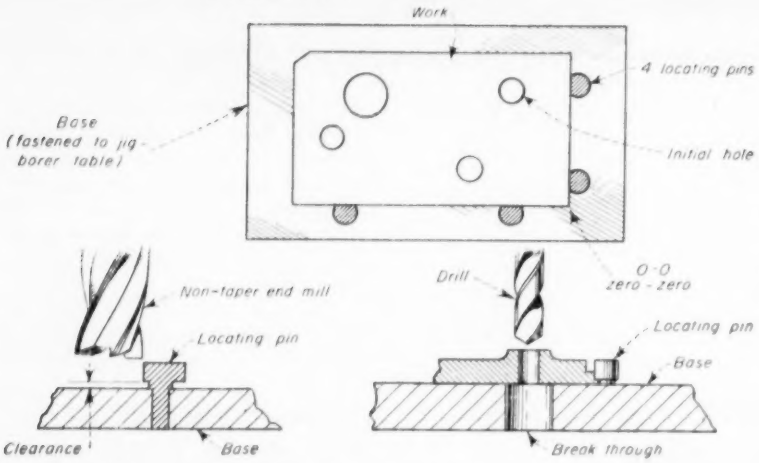


Spring-wire Used As Mandrel

A piece of spring-wire stretched between the headstock and tailstock of a lathe, acting as a mandrel, can be used for winding small springs of 1/16 in. OD or less.

This is properly tensioned between the headstock draw-back sleeve and the tailstock center, which is fitted with a holder containing an anchor pin and a ball-bearing to prevent any twisting.

The dimension of the spring to be produced is determined by 3 factors: (1) Diameter of the spring-wire mandrel (2) Distance X (3) The clamping force exerted at screws A. The tighter the clamping, the larger will be the OD of the spring. *C Y Lee, Tai-Chung, Taiwan, China*



Locating Pins Substitute for Drill Jig

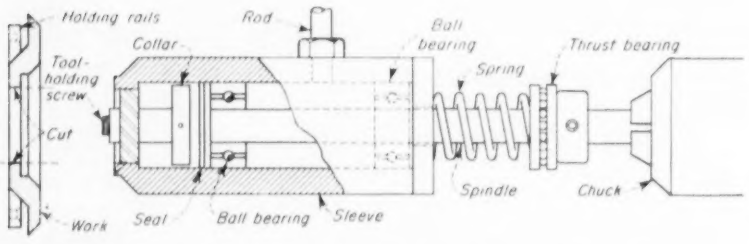
Because the number of pieces desired was small, we did not care to invest in an expensive drill jig to produce four holes in a piece of work which had to be positioned from the edges within extraordinary limits. We did possess a jig borer, and we decided to adapt this machine to the job requirements.

First we inserted four locating pins, two to a side, at right angles into a rectangular baseplate that was firmly clamped to the table of the borer. *This rigidity is very important for the least unsteadiness will destroy the important calculations to follow.* With an end mill, the four pins were then slightly flattened, thus establishing a 0 - 0 point for the baseplate and pins relative to the borer.

To reduce the possibility of excessive runout, sleeves were constructed which enabled the drill, endmill, and reamer to be directly inserted into the borer collet. This done, and the drill mounted, the spindle center or 0 point, was moved to the approximate dimension between the edge of the work and the first hole to be bored.

The first hole having been bored, the same procedure was repeated using the bottom set of pins to drill the second hole.

These two holes then were checked with a dial indicator and gage block and, upon being found accurate, boring the subsequent holes became a routine procedure. The accurate conditioning and squaring of the pins was the important part of the operation. *C Y Lee, Tai-Chung, Taiwan, China*



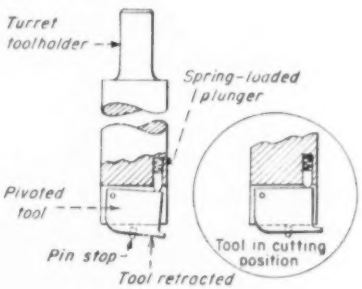
Centering Sleeve For Cutting Tool

We were required to finish-bore a cored hole in the center of a cast countersink in several thousand aluminum castings which were part of sub-assemblies, and we found that individual centering consumed a great deal of time. To eliminate this condition, we built the sleeve fixture shown around the spindle and blade of the cutting tool.

The fixture is chucked in a drill-press and is made of tubing bored to press fit on upper and lower ball bearings. The spindle, which turns in a sliding fit with the bearings, has a square hole to take a square toolbit held by a screw. Upward travel of the spindle is limited by an attached collar which carries a felt ring set in a groove to screen out chips as it contacts the race of the lower ball bearing.

A spring around the spindle, between the top of the fixture and the thrust bearing, maintains pressure against the work while the cut is being made; an extension rod from the fixture to the drill-press column prevents the sleeve from rotating. Side rails clamped to the table firmly hold the work.

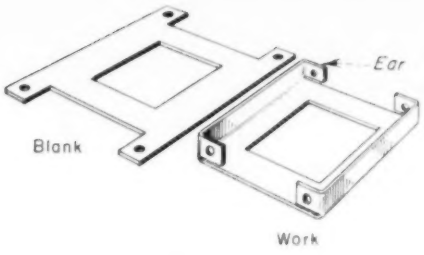
The operation is simple. As the unit is fed down, its tapered sides fit snugly against the sides of the work, and the cutter emerges and automatically centers. *Henry Gifford, Bronx, New York, NY*

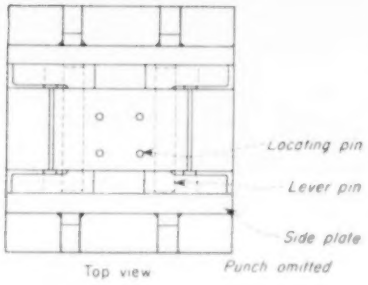


Automatic Undercutting Tool

The usual procedure for undercutting a threaded hole is to use a properly shaped toolbit of a size that will allow its insertion into the body-size hole. Then a lateral movement is required to do the undercutting.

The tool shown is automatic in function and extremely useful in quantity production. Its unique feature is a pivoted cutting tool on the bottom of which is a spherical-ended stop which actuates the tool as the toolholder descends. A spring-loaded plunger reacts when the pressure is released. *W I Morgan, Yeovil, Somerset, England*



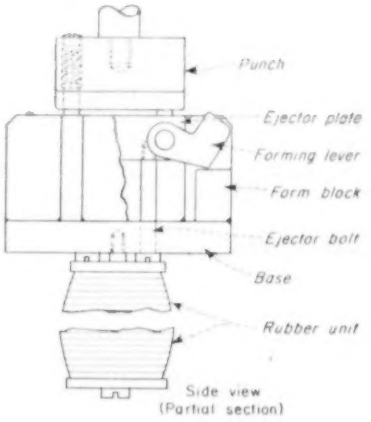


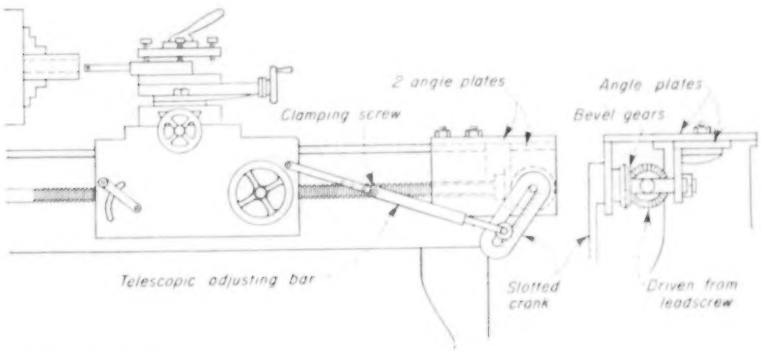
Form-Tool Bends Bracket In Three Directions

Of course the tool shown was designed to form a specific nesting-bracket, but the principle of using radial action levers, which function on the further downstroke of the punch, may be readily adapted for other bending problems.

The work was placed around the locating pins of the ejector-plate and at the first part of the stroke the walls were formed. As the stroke continued, the ears, which were turned slightly inward by this operation, were contacted by radial levers and pressed at right angles to the walls. Thus a three-direction bend was accomplished in a single stroke

The punch was supplied with standard stripper pins but in constructing this tool a sturdy and resilient unit must be provided for the ejector-plate. If this is made of rubber washers suspended by a screw from the base it will prove more satisfactory than a compression spring. *Herbert H Fronicke, Taunton, Somerset, England*



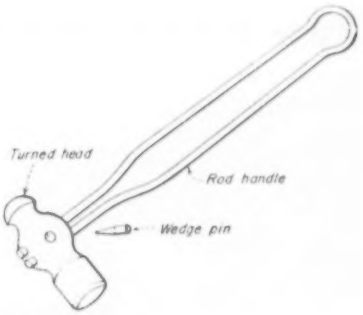


Attachment For Cutting Spiral Oil Grooves

Cutting spiral oil grooves is usually time consuming because of continual manipulation of the apron handwheel of the lathe. In quantity production the illustrated attachment, except for the return motion, is automatic, and will produce the work satisfactorily.

It consists of a pair of bevel gears mounted upon the rear of the lathe, with a slotted crank attached to the shaft of the driven gear, and a telescopic adjusting bar leading from the crank to the saddle. The slotted-crank arm is calibrated to assist the operator in setting the correct length of stroke. The telescopic adjusting arm allows the cutter to be set at the right position in the work to be cut. When the stroke has been adjusted and the cutting-tool placed in position, the clamp screws securing the adjusting arm are tightened.

By altering the gears, or gearbox levers, to change the speed of the leadscrew, a large variety of spiral oil grooves, both internal and external, can be cut. *Allan Clarke, Rochdale, Lancashire, England*

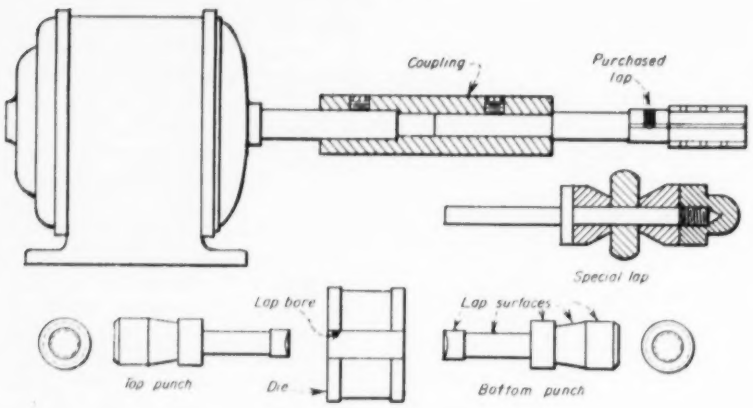


All-Steel Hammer Is Long-Lasting

A lot of old toolmakers will snort in disgust at this one, but it works fine in our shop. In fact, we have a full set of hammers, ranging from small toolmaking ones to large smashers, hanging on the wall.

The hammers are made of steel, cold-rolled or whatever available. The heads are fully turned on a lathe, even to the ball-peen tip. Each handle is a length of heavy steel wire—or small-diameter rod, if you prefer, with each end of the wire inserted into a hole drilled into the head. The handle is locked by a pin with flattened ends, this being forced into a cross hole in the head. The pin should be harder than the handle so it will distort the rod enough to lock it.

This kind of hammer does away with the old, familiar hickory, but it lasts and lasts, keeping repairs to a minimum. The design prevents twisting in your hand. *N Palmer, Paddington, NSW, Australia.*

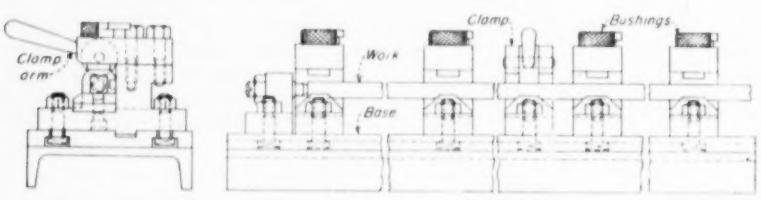


Direct Motor Drive Runs Bore-Lapping Spindle

In a shop without elaborate lapping equipment, this rig does small-dia work very well. For bores, a commercial split-bushing copper lap is attached directly to the motor spindle by a strong, rigid coupling. This handles the ID of the die, which is illustrated with two punches, top and bottom.

For the punches of the same die-set, we attach the second lapping spindle, which consists of a steel shank and several wooden rollers, all assembled on the same axis. The punches or small-dia round parts are held by hand against the spindle as it rotates at high speed.

The purpose of the motor and the direct drive is to produce a high spindle speed at the lap, resulting in good action to superfinish the work. Lapping is done with this arrangement after the punches and dies are hardened and ground, and is successful in removing grind marks from the finished surfaces. *B Goodwin, Kentish Town, England.*



Adjustable Drill Jig

Farm machinery we were making required several kinds of shafts of various lengths drilled at varying locations and to different diameters. To keep cost down we designed this adjustable drill jig that can be handled on a drill table, and can be moved under a gang drill.

The base is a channel iron with a T-slotted member in which several drill-bushing supports can be clamped. The slot allows repositioning the bushing holders after each short run. Clamping is done with one or two eccentric clamps, which are quick acting. Rods or shaft from 15 to 50 in. long can be handled, and bushings for drill holes from $\frac{5}{8}$ to 1 in. can be set up at any spacings required.

The clamps are adjustable for the different work diameters. Bushing liners, being standard, can be quickly replaced for a new run of five or six hundred parts. This rig has worked for some time, and has saved considerable money. *H Dahl, Uplands Vasby, Sweden*

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JUDGES — **A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.**

REQUIREMENTS — **Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.**

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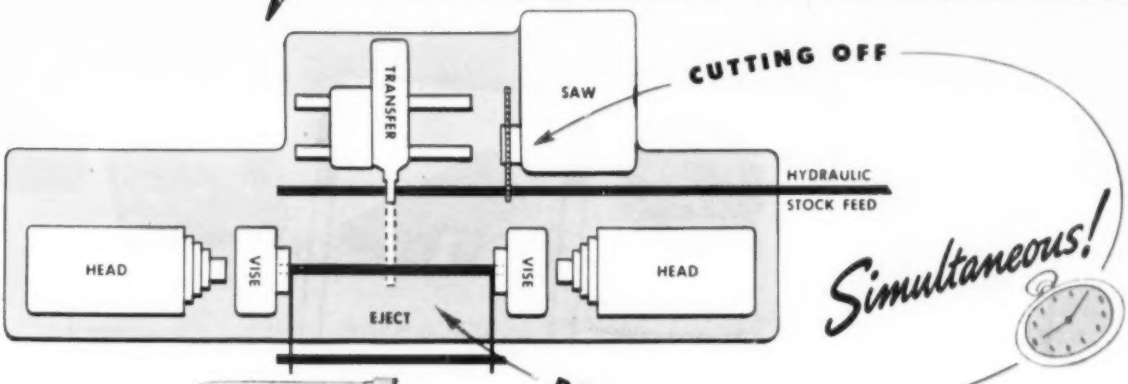
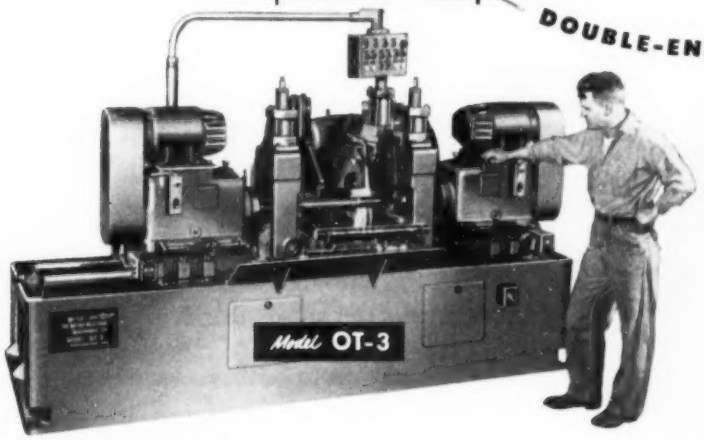
Variety..

CUT OFF while you DOUBLE-END MACHINE on MOTCH & MERRYWEATHER AUTOMATIC TRANSFER MACHINES!





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Most Production per Square Foot

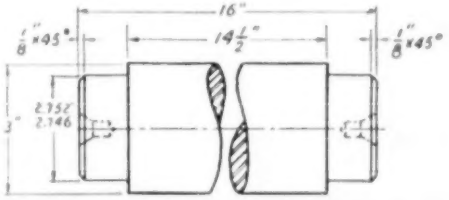
PRO REDUCE PROFIT COSTS... Three or four machines in one. Cut off to accurate length and double-end machine simultaneously. Cut-off time is virtually "free". *Change-over quick from job to job!* Ideal for short or production runs. Cycle fully automatic. *Remember:* it's the cost per piece that counts.

Case Study No. 182

Operation: Cut off, box mill, turn and center drill both ends.

Material: SAE 1020.

Production: 110 pieces per hr.



SPECIFICATIONS

ITEM	Model OT-3	Model OT-4½	Model 2T-6
Rated diameter stock	½" to 3"	¾" to 4½"	1" to 6"
*Standard work length	8" to 40"	8" to 40"	8" to 40"
Weight (approximate)	11,500 lbs.	15,000 lbs.	26,000 lbs.

*Work length can be increased by special arrangement.
NOTE: Supplied for ferrous or non-ferrous applications.

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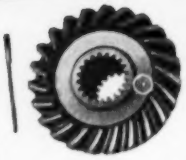
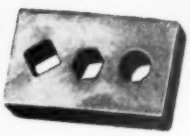
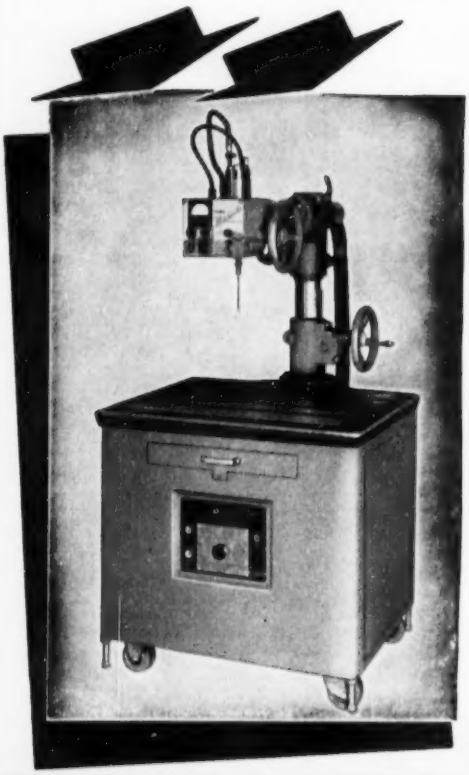


Cut oil holes in hardened gears without annealing

Cut dovetails in hardened dies



Cut any shape hole in cemented carbides



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

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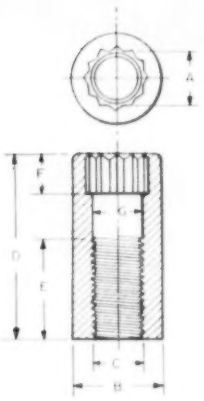
REFERENCE BOOK SHEET

Standard Pilot Nuts for Dies

BY J R PAQUIN



DIMENSIONS OF PILOT NUTS

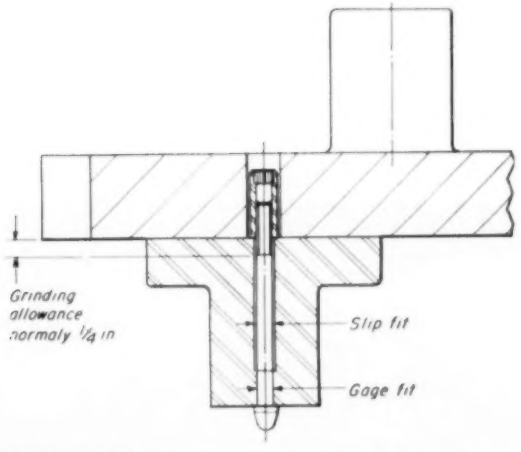
Nut Size	Socket Width Across Flats	Body Dia	Tap Size NC-3	Body Lgth	Thd Lgth.	Socket Depth	Clear Hole
	A	B	C	D	E	F	G
No. 4	1/8	0.187	#4-48	1	1/4	0.076	#32(0.116)
No. 5	1/8	0.187	#5-44	1	1/4	0.082	#30(0.1285)
*No. 6	5/32	0.257	#6-40	1	5/16	0.100	#27(0.144)
*No. 8	3/16	0.280	#8-36	1	3/8	0.112	#18(0.1695)
*No. 10	3/16	0.302	#10-32	1	7/16	0.142	#9 (0.196)
*1/4	1/4	0.403	1/4-28	1	1/2	0.172	#F(0.257)
5/16	5/16	0.498	5/16-24	1	5/8	0.231	#P(0.323)
3/8	3/8	0.590	3/8-24	1	3/4	0.250	#W(0.386)

Note: Hexagon "A" must be double, as shown
*Most frequently used sizes

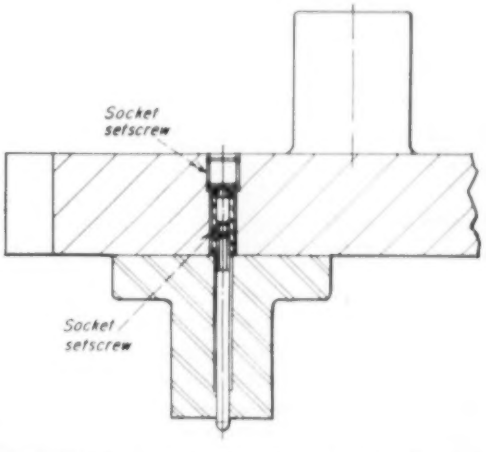
Pilot nuts represent the fastest and most convenient method of fastening pilots in progressive dies. Their use allows the pilots to be quickly removed for sharpening without the necessity of dismantling other die parts.

Standardized, and stocked in the tool crib, the pilot nuts effect substantial savings in both designing and manufacture of progressive dies, and further savings on the press line in making possible speedy pilot removal and replacement.

The most used sizes will vary from shop to shop, depending on the general sizes of parts to be run. Cold form the double hex before final turning of the outside diameter. Make the nuts from drill rod, heat treated; or machine steel, cyanide hardened.



FOR SHOULDER PILOTS the nut is applied through the punch holder. In this way both pilot and nut can be removed for punch sharpening without disturbing the punch. Ample grinding allowance has been applied



WHEN USING small, straight pilots made from drill rod, the nut is threaded on the pilot shank and locked by a small setscrew. A larger setscrew, threaded in the punch holder, locks the entire assembly.

To remove the pilot for punch sharpening, the large setscrew is removed, allowing the pilot-and-nut assembly to be withdrawn through the punch holder. Loosening the small setscrew allows backing off the pilot to compensate for the amount removed in sharpening. It is then again locked in place by the small setscrew before replacing the assembly in the die.

Wickman

TAPPING ATTACHMENTS

for turret lathes

Eliminate COSTLY TAP BREAKAGE

This tapping attachment is designed specifically for turret lathe use. It is considerably shorter than the well-known Wickman Tappers Model T and Wickman Combination Tappers Model TS, and incorporates the same exclusive design features, allowing for presetting the tapping torque required for any tap size or material. They also afford the same well-proven and unfailing safety features, preventing tap breakage in blind hole tapping or materials difficult to tap.

MODELS AVAILABLE

MODEL	RANGE*	SHANK		LENGTH	DIA.
		Dia.	Length	Overall	Max.
T-2-S	3/8" to 1"	1 1/2"	3 1/16"	8 9/16"	3 7/16"
T-3-S	1/4" to 1/2"	1"	2 1/2"	6 7/8"	3 3/16"

**Quick change tap adaptors included with attachment.*

In addition, WICKMAN Tapping Attachments:

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- Fit directly into the turret socket
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- Assure consistent accuracy
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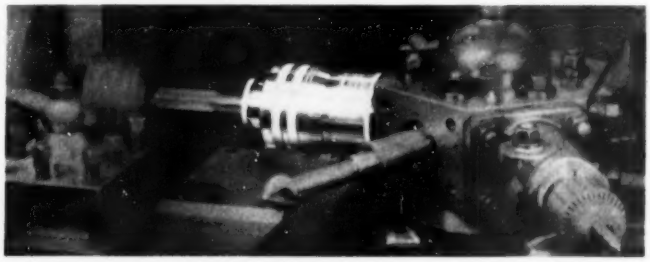

THE Wickman MANUFACTURING CO.

10325 CAPITAL AVENUE
OAK PARK (Detroit 37), MICH.

American Machinist REFERENCE BOOK SHEET

Time for Drilling Mild Steel

BY V G HOTCHKISS

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Table I gives the actual minutes per inch for drilling mild steel at the recommended speeds and feeds. The drill-point length and break-through distance are shown for each diameter of drill. This must be added to the depth of hole drilled to obtain the total distance drilled.

Tool-care allowance is shown as a percentage of machine time and also, as minutes per inch of depth drilled. This allowance is based on 250 in. of mild steel drilled between tool grinds (at recommended speeds and feeds), and the normal minutes required to make the change from the worn tool to the sharp tool.

Table II is provided for calculating the actual minutes for deep-hole drilling. This is based on the ratio of depth of hole to diameter of drill, and is shown as a percentage by which the actual minutes must be increased for deep-hole drilling. In effect, it is a decrease of speed and feed, in increasing amounts, as this ratio becomes greater.

Examples explain the use of the tables and bring out how the drill-point length and break-through distance are added to the depth of the hole. The examples show how the ratio is obtained to determine if the job is deep-hole drilling, and if the ratio is 3 or more, how to increase the actual time for drilling. The examples show how to make allowance for tool care based on depth drilled.

table I . . . ACTUAL MINUTES FOR DRILLING MILD STEEL WITH HSS DRILLS

Drill Dia	Ipr	Rpm*	Act. Min. Per In.	A	B	A + B	Tool Care %	Tool Care Min. per In
1/16	0.003	5496	0.061	0.019	0.006	0.025	8.0	0.005
3/32	0.0035	3664	0.078	0.028	0.009	0.037	6.0	0.005
1/8	0.004	2748	0.091	0.038	0.012	0.050	5.5	0.005
5/32	0.0045	2198	0.101	0.047	0.016	0.063	5.0	0.005
3/16	0.005	1832	0.109	0.056	0.019	0.075	5.0	0.005
7/32	0.0055	1570	0.116	0.066	0.022	0.088	5.0	0.006
1/4	0.006	1374	0.121	0.075	0.025	0.100	5.0	0.006
9/32	0.0065	1221	0.126	0.084	0.028	0.112	5.0	0.006
5/16	0.007	1099	0.130	0.094	0.031	0.125	5.0	0.007
11/32	0.0075	999	0.133	0.103	0.034	0.137	5.0	0.007
3/8	0.008	916	0.136	0.113	0.037	0.150	5.0	0.007
13/32	0.0085	846	0.139	0.122	0.041	0.163	5.0	0.007
7/16	0.009	785	0.142	0.131	0.044	0.175	5.0	0.007
15/32	0.0095	733	0.144	0.141	0.047	0.188	5.0	0.007
1/2	0.010	687	0.146	0.150	0.050	0.200	5.0	0.007
9/16	0.0105	611	0.156	0.169	0.056	0.225	5.0	0.008
5/8	0.011	550	0.165	0.187	0.063	0.250	5.0	0.008
11/16	0.0115	500	0.174	0.206	0.369	0.275	5.0	0.009
3/4	0.012	458	0.182	0.225	0.075	0.300	5.5	0.010
13/16	0.0125	423	0.189	0.244	0.081	0.325	5.5	0.010
7/8	0.013	393	0.196	0.262	0.088	0.350	5.5	0.011
15/16	0.0135	366	0.202	0.281	0.094	0.375	6.0	0.012
1	0.014	344	0.208	0.300	0.100	0.400	6.0	0.013
1 1/8	0.015	305	0.218	0.338	0.112	0.450	6.5	0.014
1 1/4	0.016	275	0.227	0.375	0.125	0.500	7.0	0.016
1 3/8	0.017	250	0.235	0.413	0.137	0.550	7.5	0.018
1 1/2	0.018	229	0.243	0.450	0.150	0.600	8.0	0.019
1 5/8	0.019	211	0.249	0.488	0.162	0.650	8.5	0.021
1 3/4	0.020	196	0.255	0.525	0.175	0.700	8.5	0.022
1 7/8	0.021	183	0.260	0.563	0.187	0.750	9.0	0.023
2	0.022	172	0.265	0.600	0.200	0.800	9.0	0.024

**For cutting speed of 90 fpm.*
A = Drill-point Length = 0.3 drill dia.
B = Break through = 0.1 dia.

EXAMPLES OF DRILLING MILD STEEL

1st Example:

Depth of hole, 1 in.; drill dia, ½ in.; ratio, 2

Total depth:

Hole depth = 1.000
A + B = 0.200
1.200

Actual Min.—

1.200 × 0.146 = 0.175

Tool care—

1.200 × 0.007 = 0.008

Total = 0.183

2nd Example:

Depth of hole, 1 in.; drill dia, ¼ in., ratio, 4

Total depth:

Hole depth = 1.000
A + B = 0.100
1.100

Actual Min. —

1.100 × 0.121 × 1.39 = 0.185

Tool care—

1.100 × 0.006 = 0.007

Total = 0.192

table II . . . INCREASE IN ACTUAL MIN. FOR DEEP-HOLE DRILLING

Radio Hole Depth to Drill Dia	Increase Actual Min.
3	23
4	39
5	57
6	78
7	92
8	108

Minimum Ratio 3.
Use nearest whole ratio number.

No Single Hydraulic Oil Fits All Operating Conditions Economically

That's why Sun makes a variety of oils to give top performance and economy in any system

The selection of the right hydraulic oil is determined by many factors, such as average operating temperature; rate of leakage; contamination caused by cutting fluid, water and dirt. *No single oil will meet all combinations of conditions economically.* It's sensible, therefore, to choose a hydraulic oil with care . . . to be sure that it will give top performance at lowest possible cost. Consult your local Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Department AM-8.

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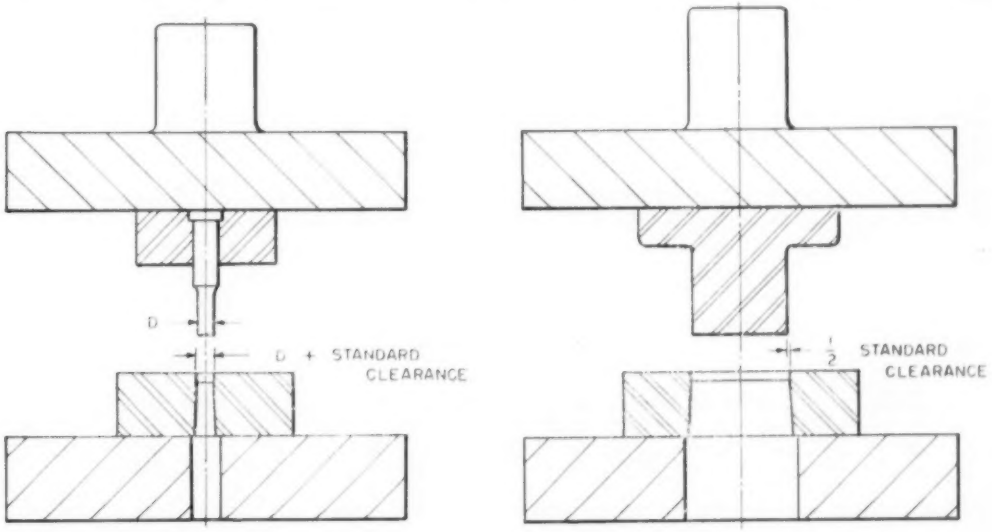
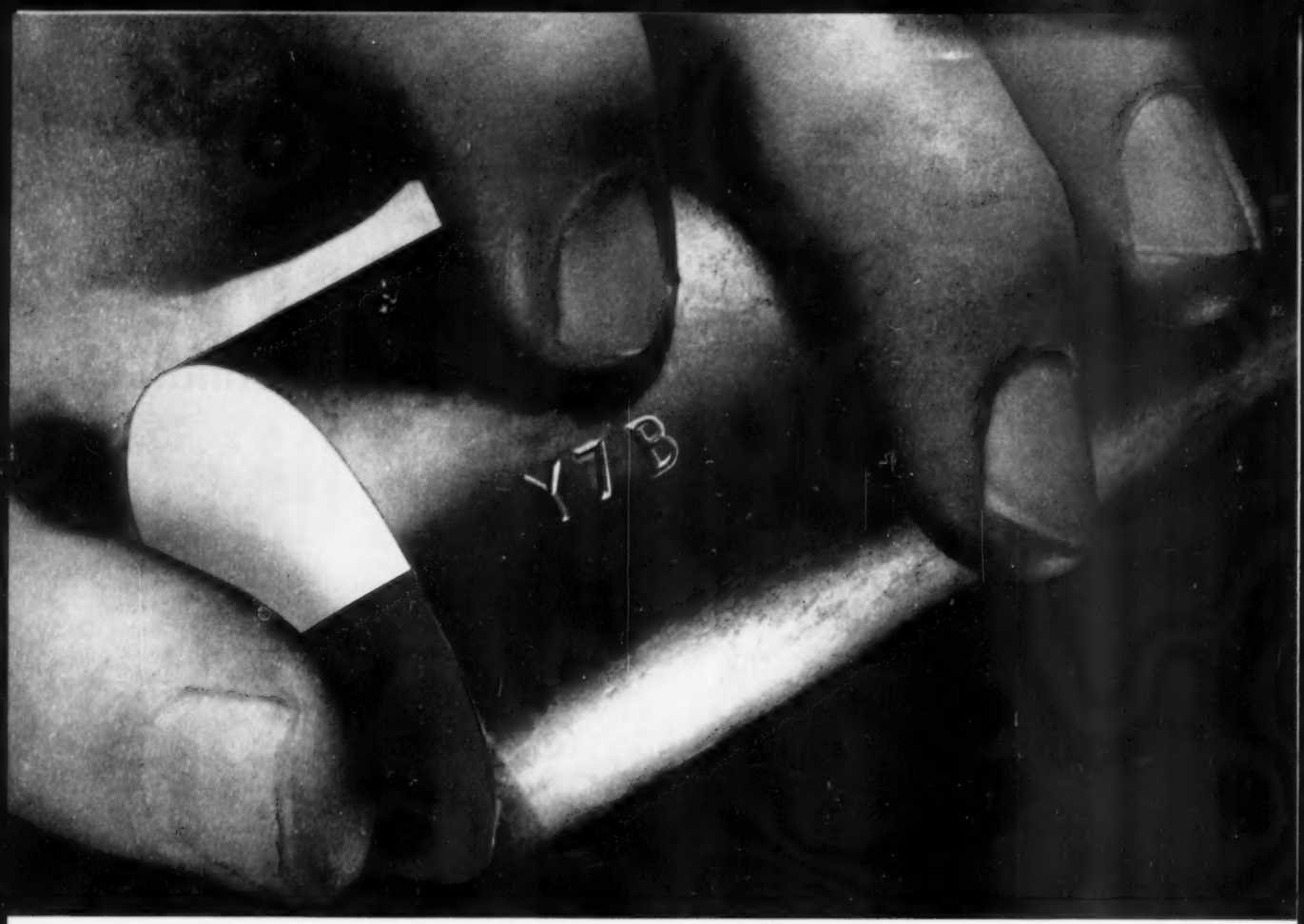
STANDARD PUNCH AND DIE CLEARANCES

By J R PAQUIN

STOCK THICKNESS	SOFT STEEL	MEDIUM STEEL	HARD STEEL	STAINLESS STEEL	PHOSPHOR BRONZE	BRASS	COPPER	ALUMINUM
0.010	0.0006	0.0006	0.0007	0.0008	0.0006	0.0005	0.0005	0.001
0.020	0.0011	0.0012	0.0014	0.0016	0.0012	0.001	0.0009	0.002
0.030	0.0017	0.0018	0.0021	0.0024	0.0018	0.0015	0.0014	0.003
0.040	0.0023	0.0025	0.0028	0.0032	0.0025	0.002	0.0019	0.004
0.050	0.0029	0.0031	0.0035	0.004	0.0031	0.0025	0.0023	0.005
0.060	0.0035	0.0037	0.0043	0.0048	0.0037	0.003	0.0028	0.006
0.070	0.0041	0.0043	0.005	0.0056	0.0043	0.0035	0.0033	0.007
0.080	0.0047	0.005	0.0057	0.0064	0.005	0.004	0.0038	0.008
0.090	0.0052	0.0056	0.0064	0.0072	0.0056	0.0045	0.0042	0.009
0.100	0.0058	0.0062	0.0071	0.008	0.0062	0.005	0.0047	0.010
0.110	0.0064	0.0069	0.0078	0.0088	0.0069	0.0055	0.0052	0.011
0.120	0.007	0.0075	0.0085	0.0096	0.0075	0.006	0.0057	0.012
0.130	0.0076	0.0081	0.0093	0.0104	0.0081	0.0065	0.0062	0.0162
0.140	0.0082	0.0087	0.010	0.0112	0.0087	0.007	0.0066	0.0175
0.150	0.0088	0.0093	0.0107	0.012	0.0093	0.0075	0.0071	0.0187
0.160	0.0094	0.010	0.0114	0.0128	0.010	0.008	0.0076	0.020
0.170	0.010	0.0106	0.0121	0.0136	0.0106	0.0085	0.008	0.0212
0.180	0.0105	0.0112	0.0128	0.0144	0.0112	0.009	0.0085	0.0225
0.190	0.0111	0.0118	0.0135	0.0152	0.0118	0.0095	0.009	0.0237
0.200	0.0117	0.0125	0.0142	0.016	0.0125	0.010	0.0095	0.025
0.210	0.0123	0.0131	0.015	0.0168	0.0131	0.0105	0.010	0.0262
0.220	0.0129	0.0137	0.0157	0.0176	0.0137	0.011	0.0104	0.0275
0.230	0.0135	0.0143	0.0164	0.0184	0.0143	0.0115	0.0109	0.0287
0.240	0.0141	0.015	0.0171	0.0192	0.015	0.012	0.0114	0.030
0.250	0.0147	0.0156	0.0178	0.020	0.0156	0.0125	0.0119	0.0312

The values given in this table apply to over all clearances, or diameters. Stock thicknesses are used by industry are in terms of gages or decimal thicknesses. In either case, the clearance can be interpolated by reference to values tabulated above. For clearances "on a side," divide the given values by 2.





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Your protection begins with careful selection of the heats to be carried in our stock. Next, analysis is verified and all Ryerson alloys are spark tested to guard against mixed steels. Then the bars are color marked and stamped to identify type and heat. Meanwhile, we test a sample of every heat for hardenability and interpret the test results for you. So, finally, when you call Ryerson for alloys, you can be SURE—sure of the steel you get and sure of what it will do.

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TALKING SHOP

Taller Men

A NEW ASA code requires guarding of all transmission equipment to a minimum of 7 ft, recognition that men of today are taller. The new code for Mechanical Power-Transmission Apparatus is B15.1—1953. Previous requirements varied from 5½ to 6½ ft. Safety requirements for V-pulleys and V-belt drives are also included for the first time.

Grounded Plant

FORD, at the new Oakville (Ont) plant, has a very complex wiring system, and a proportionately unusual grounding system as a safety feature. A single, heavy copper cable, about 6000 ft long, circles the assembly building. Smaller cables branch from it to be welded to the base of every steel column and every major piping system. Thus any electrical leak may blow a fuse, but is thereafter grounded. So is static electricity.

Solar Carbides

SOLAR AIRCRAFT COMPANY, San Diego, has been making its own carbide cutting tools for the last three years. Bits are purchased in standard shapes, and shanks milled to fit for about 1500 tools a month. The 6-man tool-grinding department produces about 1000 different shapes and sizes, 200 standard. Savings have been about $50,000 a year, plus elimination of a $40,000 tool inventory and faster attainment of special tools. Used carbide tips are salvaged for sale by the pound, shanks are salvaged for reshaping.

Solar estimates the average tool is sharpened 15 to 50 times, removes 30 to 40 cu in. of alloy steel between grinds. The company built its own brazing furnace for $75, now estimates 85% of its tools are cemented carbides.

Negative Acceleration

NATIONAL BUREAU OF STANDARDS has added equipment to study effects of high accelerations, like those to which ordnance projectiles are subjected. One is an air gun made of eight 90-mm gun barrels bored to 4-in. dia, flanged and bolted together to form a 96-ft tube supported by concrete piers. The projectile is speeded by application of 125-psi air up to as high as 880 fps, then stopped by plowing into a catcher box filled with sand, lead, or some other material. Thus a negative acceleration is achieved for projectiles weighing 6 to 18 lb. A steel projectile can penetrate 8 in. of lead under maximum conditions.

A 22-ft air gun, four centrifuges (one capable of accelerations of 60,000 G's on 1-lb specimens), a 300-fps wind tunnel, and a droptower 87 ft 8 in. high are also included. The latter gives a max impact velocity of 74.5 fps, and a negative acceleration up to 50,000 G's on impact. Thus a variety of tests can be made on objects of many sizes and shapes.

Biggest Camera?

CONVAIR has just installed at San Diego one of the largest templet cameras in the aircraft industry. Of a new type, the new camera is 29 ft long, has an all-metal copyboard 12 ft long and 5 ft high. It can enlarge up to 4 times, reduce throughout a range of 1 to 13. Reproductions are accurate to 0.002 in. in 12 ft, so drawing and lofting can be done to any scale desired and models can be built to different scales without the time-consuming redrawing of the master. Current uses of the camera are for shrink reproductions of plaster patterns and for mockups in 1-in. plywood, in addition to more common jobs. Copy for the camera can weigh up to 200 lb, is held firmly against the copyboard by vacuum. Dryplate negatives as big as 42 x 52 in. are made on 0.190-in. glass for accuracy, and shot at ¼ scale for easier handling. Both lens and capyboard settings are to 0.001 in. for ease of duplication.

Big Bore

NATIONAL SUPPLY CO has just installed at Torrance, Calif, the largest horizontal boring, drilling & milling machine on the Pacific Coast. It is a Series 50 Giddings & Lewis unit, with 12 x 24-ft floor-level table and 7-in.-dia spindle. Before installation, one building column had to be removed for clearance. Oil-field machinery and equipment, marine parts, etc, are produced on it.

No Night Bathing

WHEN American Electro Metal Co sent out samples of a new material, Borolite I, a metal-ceramic sintered compound, for tests by several prospective buyers, almost all companies reported that material stood up well when immersed in molten aluminum, but one outfit said it had eaten away overnight. A little sleuthing showed a night watchman had seen the test rods in the bath, and had removed them on the grounds that they must not have been intended to be there.

Going Up

AS OTIS ELEVATOR of Yonkers, NY, celebrates its centenary, it is surprising to realize that the first year's business for the company was $900. Of course, the total inventory was only $122.71, including a 2nd-hand lathe and two oil cans. Elisha Otis had added only one feature to hoists, but an important one—an automatic safety device that kept the car from falling if the cable broke . . . All early elevators were for materials —the first passenger elevator wasn't made until 1857, in a store in New York City. Before that, buildings were limited to four or five floors.

News of Metalworking

Senate Halves Vance Plan Fund in Surprise Move: Congress May Compromise on $375 Million

WASHINGTON — The $500-million Vance Plan fund for reserve tools and facilities will probably be scaled down to about $375 million for fiscal 1954. That was the prospect at press time—after the $500-million Vance Plan money, voted last month by the House as part of the Defense Department's Appropriation Bill, was cut in half by the Senate Appropriations Committee. It was expected that the Senate would retain the cut and that a compromise between the two versions would be made at a Senate-House conference later.

Cut a "Complete Surprise"

The Senate cut came as a complete surprise. When the House had voted the reserve tool money, which both the Truman and Eisenhower administrations had requested, it was assumed that the Senate would also approve. Traditionally, the House makes the appropriations cuts: the Senate restores them.

Major reason for the Senate cut: the Defense Department's vague explanation of how the $500 million fund would be spent.

Although the Senate Committee enthusiastically OK'd the Vance Plan, its appropriation report said "from testimony presented . . . it does not appear that plans have been developed sufficiently to warrant a larger appropriation at this time than . . . $250 million."

$500 Million Too Much?

This was a reference to remarks by Lyle S Garlock, the Pentagon's Deputy Controller for Budget, who presented the Vance Plan case at the Senate's appropriations hearings. In substance, Garlock repeated what Defense Secretary Wilson had previously told the House Appropriations Committee: that the Pentagon did not know whether it would need as much as $500 million for reserve tools, and that it didn't know exactly what machinery would be bought.

In his testimony, Garlock cited foundry capacity to make heavy castings for medium tank turrets and hulls as typical of equipment that could be bought with Vance Plan money.

Equipment bought under the program, he said, would be put in "straight storage" or in private plants where possible. In the latter case, if the tools had any normal application, the government would receive free maintenance and revenue based on number of hours used or number of units produced. This would be in line with Wilson's dual- and standby-plant proposal, he explained.

Another reason for the Senate cut: of the more than $6 billion appropriated since Korea to the military services for defense plant expansion (including $4.1 billion for machine tools), $600 million was still unspent on June 30. The $600 million figure represents plant construction and purchase and installation of equipment.

Combining the $600 million outstanding for "defense plant expansion" and the $250-million Vance Plan appropriation for "mobilization reserve purposes," the Senate Committee reported that $850 million would be available for obligation for fiscal 1954.

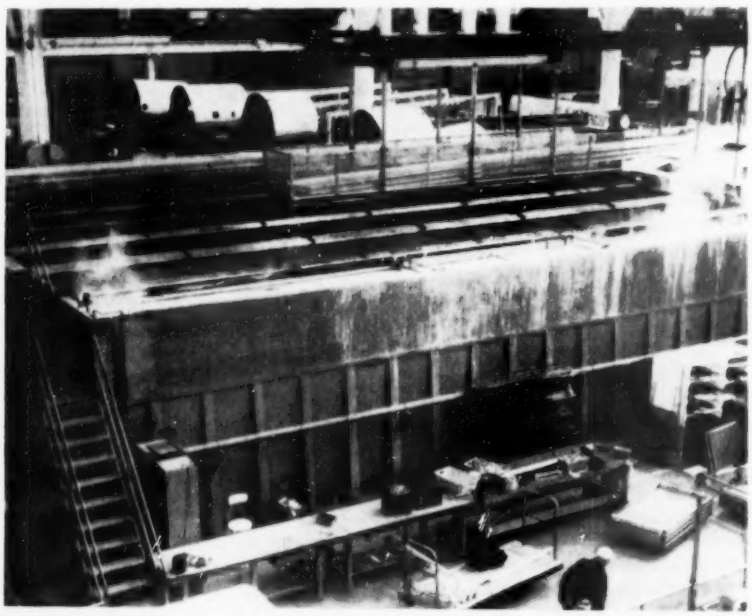
Pentagon officials later implied that the two programs blended so much that funds could be spent interchangeably.

Technically, the $600 million outstanding for plant expansion is for current plant and tool needs: Vance Plan money is for future requirements. But actually it's difficult to separate them.

Examples: (1) the illustration by Pentagon officials of increased foundry capacity — definitely a current need—as a project to be financed by Vance Plan money; (2) the Pentagon's past interpretation that procurement authority for plant expansion could include reserve tools.

Actually, this talk is strictly academic. The government can't be expected to spend a great deal on machine tools. Wilson has emphasized that he will be tight on Vance Plan money—no matter how much it is.

Too, the Pentagon has an informal freeze on the unspent $600 million plant expansion funds. Most of this has been earmarked for the Air Force. And until the 143-wing vs 120-wing battle is settled, defense expansion will stay frozen.



CHEMICAL BATHTUB THAT CAN HOLD BIGGEST AIRFRAME COMPONENTS is now in operation at Lockheed Aircraft Corp, Burbank, Calif. Installed at a cost of $165,000, the nine-unit metal processing tank prepares and cleans aluminum by the chromodize-iridite method. Four-ton crane dunks aircraft parts in and out of the nine 18,000-gal, 52 ft long, 12-ft-deep, 4-ft-wide tanks

FIELD FABRICATION OF ALUMINUM ROOFING PANELS is accomplished at the job site by this forming machine. Unit is tilted to same angle as that of roof. Guide rack is then run from machine to roof and 16-in. aluminum sheet is fed through to form the pan. Simultaneously, 3 9/16-in. strip is run in alongside and is crimped to the surface to provide extra strength and allow the roof to "breathe." Pans are spaced 1½-in. apart, snapped together with patented clips nailed to the deck, and capped with battens. The result: seamless, lapless, jointless pans that run from eave to ridge to eave

Senate Waters Down Bill to Cut Duty on Outside-US Metal Processing

WASHINGTON—The Senate this week chopped the heart out of the Customs Simplification Bill—the only trade liberalization measure demanded by the Administration during this session of Congress. The House must still agree to the Senate bill, but there is little doubt that the Senate will prevail.

Deleted was a major provision that would have affected the US metalworking industry—one permitting US manufacturers to send finished metal manufactures abroad for additional processing and to pay duty only on the value added abroad, instead of the total value of the article, when it would be re-imported into the United States. The House voted for this provision, but it was cut out by the Senate.

Under the provision, an automobile manufacturer in Detroit, for example, could have sent gear blanks to Canada to get the teeth cut in. He would have paid duty only on the difference in value between the finished gear and the blank. But now he will continue to be liable for duty on the total value of the gear as a result of the Senate's action.

The Senate also cut out of the bill a provision for changing the basis for assessing the total value of imports. Duty would be assessed on what the exporter's list price to the US is, rather than on a complicated measure of the value in other foreign markets. This provision had mustered opposition of chemical and toy industries.

Unexpected Action

The Treasury and State Departments were surprised by the Senate action. It had been expected that the Senate would go along with the House bill. But several industry spokesmen, notably from the chemical industry, apparently persuaded key Senators that the valuation and foreign processing proposals were too controversial to be acted upon without further hearings. These hearings, with Congress rushing to adjourn, would probably have doomed passage of the bill this session. So Senate leaders agreed to delete the controversial provisions from the bill.

Metalworking Abroad

(McGraw-Hill World News)

ITALY — International Mechanical Engineering Congress, to be held in Turin October 8-15, will be followed by a six-day study tour of Italian metalworking firms. Included on the tour will be visits to shipyards, foundries, engine works, instrument plants, iron and steel works and the Mingati machine-tool works at Bologna, Italy.

AUSTRIA—Foundations have been laid at the MAVAG plant in Vienna for a 70-ton carrousel-type boring mill for manufacturing locomotive flywheels. Chuck face measures 3.10 meters in diameter. Seven meters high, the mill can machine a job 2 meters high, weighing 20 tons. In case of trouble, machine stops automatically and a signal chart gives exact location of the defect.

HUNGARY — Machinists here claim the new Koleslav method (use of small cutters on lathes set progressively so that first cutters do the rough work while the last cutter makes the finished surface, all in one operation) can machine a piece that previously required 5 min in as little as 30 seconds.

UNITED KINGDOM—Production of metal consumer goods has been in a slump since 1952, exception is TV sets. Machinery output has been limited recently by lower demand. Shipbuilding has been cut back due to shortage of steel plate. One bright spot: British passenger car output for the first five months is nearly 20% ahead of last year.

AUSTRALIA — Manufacturers of heavy machinery are finding good markets in South Asia and the Far East. More than $20 million worth of vehicles, diesel electric locomotives, electrical equipment, earthmoving and roadmaking machinery and machine tools were exported in the first 10 months of the fiscal year. Limiting factor on Australia's export market; high-cost of manufacture.

PHILIPPINES—German motorcycle-manufacturing firm, Han-Manila, is seeking tax exemption here as a "new and necessary industry" by establishing an assembly plant in Manila. Plans are also underway to set up a $1.75 million Army Ordnance and maintenance shop at Camp Murphy for manufacturing spare parts for military vehicles.

SHORT RUNS . . .

● Cancellation of Aluminum Co of America's contract to buy 1.2 billion lb of aluminum from Canada's Aluminum Ltd in the next six years has been requested by Attorney General Brownell on grounds of anti-trust violation. Also, the contract is throwing a monkey wrench into the government's plans to bring new primary US producers into the field.

● Illustrating how little of the final cost of any given product is attributable to the cost of steel, the American Iron & Steel Institute says that the steel in a $27.50 electric razor costs only a dime. Other examples: steel in an $11.95 electric iron costs 47 cents; in a $29.95 baby carriage, $2.25; in a $1984 automobile, $225; a $350 refrigerator, $13.56; a $165 typewriter, $3.85.

● Two-week training course on use of Cobalt 60 radiography in industry will be offered this fall by Technical Operations, Inc, Arlington, Mass. Half the course will be devoted to lectures, the rest to actual experiments in shielding, radiation measurement and radiography. Enrollment is limited to technicians and shop men in metalworking, mechanical engineers and radiographers.

● Second toolmaker to announce price reductions (first was GE's Carboloy Div) is Kennemetal, Inc, which has cut prices 20% on single-point brazed tools for V-threading and grooving, and up to 20% on inserts for tools and planers tools, solid boring tool blanks and blanks for pointed-nose tools. All other single-point brazed tool prices are cut 15%.

● Job-guidance for teen-agers on an area-wide basis is provided by the Industrial Information Institute, set up by Youngstown, Ohio, manufacturers. The Institute holds an annual "career preview" exposition in Youngstown, where high-school students are shown what jobs are available in the area and are told what qualifications they must have to fill them.

● First US airline to put turbo-compound-powered passenger planes into service will be Eastern Airlines, which will get 16 Lockheed Super-Constellations, four a month, starting this fall.

Ordnance to Mothball or Lease Phased-Out Plants' Machine Tools

DETROIT — Army Ordnance has made it plain that there will be no repetition of the post-World War II machine tool fiasco. Following the recent cutback in tank and military vehicle production (AM July 20, p161), Ordnance officials recently stated exactly what will be done with equipment now in plants that are due to lose defense contracts. About 100 defense plants may eventually be shut down.

When a plant is shut down, its machine tools will either:

● **Be leased to the contractor,** who can use them for civilian purposes but must maintain them in A-1 order and have them instantly available in an emergency.

● **Be "mothballed"** along with the entire plant.

● **Be stored nearby.**

But under no circumstances will the tools be sold or "lost," as was all-too-frequently the case following World War II. Nor will a "production package" (all the equipment a prime contractor needs to produce a particular component) be broken.

Everything considered, the government prefers to lease machine tools rather than mothball them. For one thing, they will be kept in better shape through use and maintenance. For another, the government will get some return on its investment that way.

However, disposal of machine tools will vary widely with different plants. For instance, at the government-owned, American Steel Foundry-operated cast armor plant in Chicago only about 40 machine tools are in place. These will be mothballed in place.

At American Locomotive Co's tank plant, $26.5 million in machine tools will be placed in mothballs in nearby structures.

Studebaker plans to lease about one-third of the equipment, valued at $1.5 million and now in place on its assembly line, at a rental of $24,000 for five years. This equipment will be used for civilian manufacture. The balance will be stored.

At Ford's Livonia, Mich, tank plant, due to be phased out in December, almost $40 million worth of machine tools will be stored in cement-floored quonset huts a half mile from the plant, which will convert to automatic transmission manufacture. Ford has contracted to maintain and guard the Livonia production package with a 12-man crew.

Machine tools for programs due to be discontinued will not be cancelled. Rather, as the tools are delivered they will go into the production packages and be mothballed or leased. However, since the tooling program is now about 99% complete, only about another $1.5 million in tools remain to be delivered.

New Small Business Agency Planned

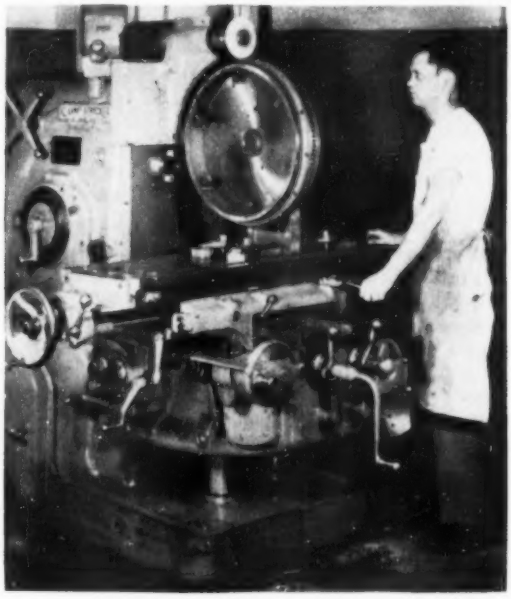
WASHINGTON — Both the House and Senate have voted bills to set up a Small Business Administration, designed to meet the needs of companies with less than 500 employees. SBA will take over the functions of the post-Korea Small Defense Plants Administration, also part of the lending functions of the Reconstruction Finance Corp, both of which are scheduled to go out of business this year.

Senate and House conferees are ironing out differences between the two SBA bills. Actually, the bills are not too far apart and it is expected most of the Senate bill's provisions will carry. These are the bills in essence:

● **Senate's bill** sets up SBA for two years; authorizes it to make small business loans up to $200,000; provides a $25 million revolving fund for disaster loans; abolishes RFC; and makes SBA's administrator chairman of its Interdepartmental Loan Policy Board.

● **House's bill** makes SBA permanent; authorizes loans up to $100,000; has no reference to disaster loans and RFC; makes the Secretary of the Treasury chairman of the Loan Policy Board.

Both the Senate and House bills kill SDPA and transfer its functions to SBA. Most SDPA personnel are expected to be retained, including Administrator W D Mitchell.



CONVERSION JOB, changing a milling machine into an external grinder, is said to save as much as two days' work on large-diameter pieces at Ace-Central States Machine Tool Co, Detroit. By this method, slots can be ground as accurately as holes on a jig borer. Indexing is done on a simple plant-made fixture. Set-up handles diameters up to 48 in.

New Act to Allow Partial Mandatory Exemption on All Capital Goods

WASHINGTON — All contracts for capital goods will be allowed the same partial mandatory exemption under a new Renegotiation Act now going through Congress. Primarily an extension of the Renegotiation Act of 1951, the new act gives the government authority to weed out excessive profits on contracts that have had performance prior to midnight, December 31, 1954.

Only major change in the new bill —aside from the one-year extension —comes under the partial mandatory exemption for new durable productive equipment. Section 106 (c) (1) was changed to include all contracts for capital goods, instead of just subcontracts. Under the former exemption, a manufacturer making a tool for direct sale to the Air Force for example, might have the entire amount of the contract subject to renegotiation. But if the tool was made for an aircraft manufacturer with an Air Force contract, only part of the subcontract would be subject to renegotiation.

Under the proposed change, all contracts for capital goods would be allowed the same partial mandatory exemption. Here's how you figure it.

Look up the useful life of the equipment as set up by the Bureau of Internal Revenue and divide it by five. Then take the total business under the contract and divide it by this figure. What's left is renegotiable business.

For example: if useful life of the equipment manufactured is 10 years, divided by five, the factor is two. If total business is $1 million, divided by two, renegotiable business is $500,000.

Right now, the Renegotiation Board is in the process of reviewing some $60 billion worth of defense contracts signed since Korea. It is still considering holdover cases from 1951-52 and the Board's appropriation request for $8.1 million for fiscal 1954 operating funds has been cut to $5.1 million. The result: staffs have been cut back 15% and unfinished business is piling up more and more.

Contractors should not be surprised if they are not called in to explain their reported renegotiable business. Reason is that the Boards check the information reported on the form and frequently determine that profit is not excessive. So, contracts are not renegotiated. Too, the work backlog may mean six months' delay until the Board gets around to examining the report.

Plant Expansion

Langley Corp, manufacturer of aircraft components and assemblies, is tripling its manufacturing area with an addition to its plant facilities in San Diego.

Electro Metallurgical Co has enlarged its facilities at its Alloy, W Va, plant. Expansion will double the company's capacity for producing medium-carbon ferromanganese.

Feedall Machine & Engineering Co has moved to its new plant at 38399 Pelton Rd, Willoughby, Ohio. The new facility has double the capacity of the the former quarters.

Mayfair Industries, Inc, manufacturer of aircraft precision parts, has completed an expansion program designed to double its capacity with the installation of $125,000 worth of new equipment.

Worthington Corp has planned a $1 million expansion and modernization program for its Plainfield, NJ, works; during the next nine months production is scheduled to be increased by one-third. Relocated machine shop will be equipped with $250,000 worth of new machine tools.

Northern Engineering Works, Detroit manufacturers of overhead traveling cranes and material handling equipment, is constructing a new 20,000-sq-ft assembly building for more efficient handling of heavier capacity, longer span cranes. In addition, fabricating facilities throughout the plant will be modernized.

Eutectic Welding Alloys Corp has broken ground for its new No. 3 Plant to be built on land adjoining Plant No. 1. Fully mechanized 273-ft long production line will be installed for high speed production of new types of electrodes recently developed by the company.

N Ransohoff, Inc, producers of equipment for surface treatment of metals, has moved to a new plant in Hamilton, Ohio, providing greatly enlarged production facilities. Administrative, engineering, experimental, and sales departments are now consolidated in one location. Expansive fabrication shop permits railroad cars and trucks to load or unload inside.

Business Items

Norton Co's Grinding Machine Div at Worcester, Mass, has established a new job lapping department, broadening its capacity to handle a wide variety of projects.

Aeroquip Corp has acquired the **Sterling Electric Motors'** plant at Van Wert, Ohio. The 45,000-sq-ft plant is located on an 11-acre plot 100 miles south of Aeroquip's main plant in Jackson, Mich. The company is transferring its Cheboygan, Mich, operations to the new facility.

Bullard Co has moved its Cleveland district office to 16828 Kinsman Rd, Shaker Heights, Ohio.

Marietta Tool & Engineering Co is moving from Marietta, Ga, to Huntsville, Ala, and expects to be in operation in the new location by Sept 1.

Lithium Corp of America, Inc, has liquidated its wholly owned subsidiary **Metalloy Corp,** which had previously operated as its chemical and sales division.

Precision Gears, Inc, is the new corporate name for Precision Machine Co, gear manufacturers of Milwaukee.

Yale & Towne Manufacturing Co, in exchange for 12,000 shares of its stock, has purchased the business and assets of the **Powdered Metal Products Corp of America,** Franklin Park, Ill. The acquisition, founded ten years ago, operates a brick plant and laboratory, employing about 85 persons.

DeVilbiss Co, Toledo manufacturers of spray finishing equipment, has expanded its metalworking division with the construction of an addition to the building presently occupied by the division. Scheduled for September completion, the new facility will permit expediting of delivery of the company's line of standard-size spray booths.

Westinghouse Electric Corp is building a plant in Duluth, Minn, to service and repair electrical equipment. In addition to standard machine shop facilities, the plant, scheduled for October completion, will be equipped with a machine for dynamic balancing of rotating machinery, metal spraying equipment, and several types of modern electrical testing apparatus.

Institutional Investment in Machinery Firms Totalled $286 Million in '52

CHICAGO — Life insurance companies and other institutional investors put up long-term loans totalling over $286 million last year for capital goods manufacturers, according to the new *1953 Yearbook of Private Placement Financing.*

• **Truck and tractor manufacturers** led the list in volume with $112 million invested in two major firms: $100 million in 3.50% 30-year notes placed for International Harvester Co, and $12 million 3.50% 16-year notes for Minneapolis-Moline.

• **Power plant equipment** investments were second in total volume, with the lion's share going for Allis-Chalmers Mfg Co's $75 million issue of 3.625% notes, due 1982. An issue of $10 million 3.25% 15-year notes was placed with a group of institutions for Babcock & Wilcox Co. Others in the field included: Foster Wheeler Corp, $5 million; Manning, Maxwell and Moore, $4 million; Bell & Gossett, $1.5 million; and Cochrane Corp, $800,000.

• **Engine manufacturers** and machinery-leasing firms obtained private placement financing totalling $23.7 million. Largest single loan in this group was an issue of $4 million 3.75% 15-year notes placed with a life insurance company for Harris-Seybold Co. American Machine & Foundry Co sold $1.45 million 5.00% preferred to a group of institutions.

• **Others in the machinery group** included: S Morgan Smith Co, $3.5 million; Buda Co, $3.5 million; Universal Winding Co, $3 million; Murray Co of Texas, $2.5 million; Saco-Lowell Shops, $2 million; Emhart Mfg Co, $1 million; San Antonio Machinery & Supply Co, $750,000; Ajax Iron Works, $600,000; Cameron Machine Co, $500,000; Randall Co, $300,000; Racine Hydraulic & Machinery, Inc, $300,000; Lewis Welding & Engineering Co, $150,000; and Carey Machinery & Supply Co, $150,000.

• **Pump and valve manufacturers** obtained $13,800,000. H K Porter Co's issue of $8 million 4.50% 15-year notes was the largest in this group, which also included New York Air Brake Co, $3 million; Schaible Co, $1.8 million:; and Duriron Co, $1 million.

• **Abrasive manufacturers** obtained $10.6 million—largest loan going to Norton Co, with $8 million in 3.50% 15-year notes. Others were $1 million placed for Exolon Co; $1 million for Electro Refractories & Abrasive Corp; and $625,000 for Bay State Abrasive Products Co.

• **Two machine tool makers** received a total of $3.75 million—Wickes Corp getting $3 million and Motch & Merriweather Machinery Co $750,000.

• **Industrial equipment** and supply makers in other categories receiving loans included: Purolator Products, $4 million; Garlock Packing Co, $3.5 million; General Gas Corp-Delta Tank Mfg Co, $2.8 million; Kennametal, Inc, $2.5 million; Commercial Shearing & Stamping Co, $2 million; Bingham-Herbrand Co, $1.8 million; Continental Foundry & Machine Co, $1.67 million; Baker-Raulang Co, $1.5 million; Pressed Steel Tank Co, $1.3 million; Osborne Mfg Co, $1.4 million; Black, Sivalls & Bryson, $1 million; R C Mahon Co, $1 million; Maloney-Crawford Tank & Mfg Co, $700,000; Meyer-Blanke Co, $400,000; E F T Tools, $350,000.

Total private placement financing in 1952 was slightly under 1951's total of $5.03 billion. Industrial corporations accounted for 65% of the total in 1952, compared with about 70% in 1951.

TESTING ENAMELED STEEL panel for adherence under torsion at US Steel Corp's new enamel laboratory, Pittsburgh. A V-shaped sheet of porcelain-enameled steel is twisted in this machine until the enameled surface cracks and flakes off, determining the exact degree of abuse that a finished product can resist

"Optional Depreciation or Obsolescence" McDonald Warns House Ways and Means Tax Hearing

WASHINGTON — Optional depreciation is the one way to settle depreciation controversies between taxpayers and Revenue agents, L D McDonald, executive vice president of Warner & Swasey Co, Cleveland, testified before the House Ways & Means Committee at a hearing July 22 on a new tax law to replace the controversial Bulletin "F."

Freedom the Keynote

In explaining his doctrine of optional depreciation, Mr McDonald said "Freedom should be the keynote as to management's judgment with respect to depreciation. Every company should be free to decide what annual depreciation it takes on new equipment purchased." The new law, he added, should be based on the sound doctrine of foreseeable risk.

Capital spent for new machine tools and similar productive equipment is essentially risk capital, Mr McDonald stated. And it is a basic principle that risk capital should not be extended beyond the reasonably foreseeable future.

"Only the manufacturer purchasing a machine tool or other productive equipment is in a position to judge the period of capital risk in his own case," Mr McDonald stated. The Internal Revenue Code should be amended to provide that the rate of tax-free recovery of capital so invested should be optional with the manufacturer. Under optional depreciation, the purchaser could write off new equipment in one, two, five, ten or twenty years at his discretion. But, he added, it would probably be impractical to permit more than an 80% writeoff the first year because of the current effect on government income.

Citing the Treasury Department's long-time opposition to optional depreciation on grounds that it would deprive the government of immediately needed revenue, Mr McDonald said that the Treasury Department ignores the fact that if a machine is written off in two years, its owner gets no tax-free depreciation allowance on it the third year. And the machine's earnings are taxable.

Under optional depreciation, little immediate tax revenue would be lost because much durable productive equipment is already covered by certificates of necessity and is already subject to accelerated depreciation.

No Revenue Loss

"It is my contention," Mr McDonald said, "that under optional depreciation, after the first few years, there would be no loss in revenue to the government—and meanwhile our country would experience a wave of modernization throughout all industry such as we have witnessed under the present tax system only in times of emergency."

Other countries, he said, permit writeoffs at a much faster rate than is allowable in the US. But the only US action has been in national emergencies, when Congress recognized that companies couldn't be expected to put money into new equipment unless they could see that it would pay its own way.

"It is my claim that there should never be any need for certificates of necessity," he said, adding "It is my claim that modernization is of itself a necessity if we are to keep this country strong . . . the tax provisions of our own government should be written not to retard modernization, but to accelerate it."

All Metalworking Affected

The problem is one that affects every US metalworking firm, Mr McDonald said. Evidence of this confronts machine tool salesmen daily when prospective customers say "If I can't write your new machine off in less than 20 years, why should I buy it?"

If the government does not correct a situation wherein American industry suffers from a tax penalty upon modernization which would increase productivity, the United States may shortly be held up before the world as an example of obsolence, he concluded.

GERMAN PROFILE GRINDER features solid comfort for the operator, plus automatic dust removal, and 20 or 40-to-1 magnification of work and wheel edge that achieves 0.0001-in. accuracy. Worktable can be swiveled with vernier protractor, adjusted longitudinally by gage blocks, and tilted by built-in sine bar. Wheelhead has fine horizontal adjustment that permits wheel to be brought into any complicated grinding position. Unit can be adjusted vertically for lateral relief grinding. Profile is drawn on transparent plastic sheet, positioned on screen over shadow of workpiece, handwheels are manipulated to cause wheel to follow outline. One turn of handwheel gives feed of 0.004 in. Rapid advance is provided by foot pedal controls. Produced by Feinmaschinenbau Prazisions-Technick, Wertheim.

Pittsburgh Steel Goes into Sheet Metal Production With Opening of $28-Million Hot Strip Mill

ALLENPORT, PA—Formal opening of a $28-million hot strip mill here July 24 marked the entry of Pittsburgh Steel Co into the sheet metal market. The new 66-in. semi-continuous hot strip mill, one of the world's fastest, is the largest installation of its kind built in the Pittsburgh area in the last decade. The mill is part of Pittsburgh Steel's $62.8 million expansion program and will add an annual output of 600,000 tons of strip and sheet to the company's products, which in the past have consisted primarily of ingot, seamless tubing and wire.

At present, the mill can produce sheets at a rate of about 1770 fpm, or nearly 20 miles per hr, using four finishing stands. Current monthly production is limited to 50,000 net tons. But when two additional finishing stands are added sometime in the future, output will be greatly increased.

The mill and finishing facilities are housed in buildings covering a 350,000 sq-ft area. The installation also contains a 500-ft continuous pickle line.

Steel slabs are barged to the Allenport mill from Pittsburgh Steel's Monessen Works, five miles downriver. Unloaded at the mill's dock, they are inspected, scarfed and stored. From there, the slabs move to the magazine end of two heating furnaces, where they are stripped off individually and fed into the furnaces by automatic pushers. They are then heated by two triple-zone gas furnaces.

Radiation pyrometers check temperatures as slabs are discharged onto a roller table. Slabs then pass through a scale breaking stand and into the reversing rougher equipped with two 3-ft working rolls and two 4-ft back-up rolls. In five passes, the slab is reduced from 5 in. to about ½ in. Vertical edging rolls maintain constant width. As slab emerges, temperature is checked, a crop shear cuts off rough ends and descaling operation is repeated.

Slabs now move in tandem into the first of four 4-high finishing stands. Each stand has two working rolls and two back-up rolls. As the steel passes between rolls on all four finishing stands at once, it is quickly elongated. Looper tables between stands maintain desired sheet tension. Steel comes through final stand at speeds up to 20 mph, reduced uniformly to sheets as thin as 65/1000 in.

Steel is cooled by water sprays as it travels to the coiling pit. From there, it goes into coil storage for further cooling. Once they are cooled, coils can be shipped or processed through a 500-ft continuous pickle line, where they are again descaled, trimmed, and welded or stitched to form a continuous ribbon. Sheet is then fed smoothly into four 70-ft-long tanks of sulphuric acid. Total immersion time is 45 seconds. Continuous sheet is again sheared into coil length, side-trimmed, oiled and recoiled. Sheet is then ready for shipment or for hot-mill or cold-mill finishing, as desired.

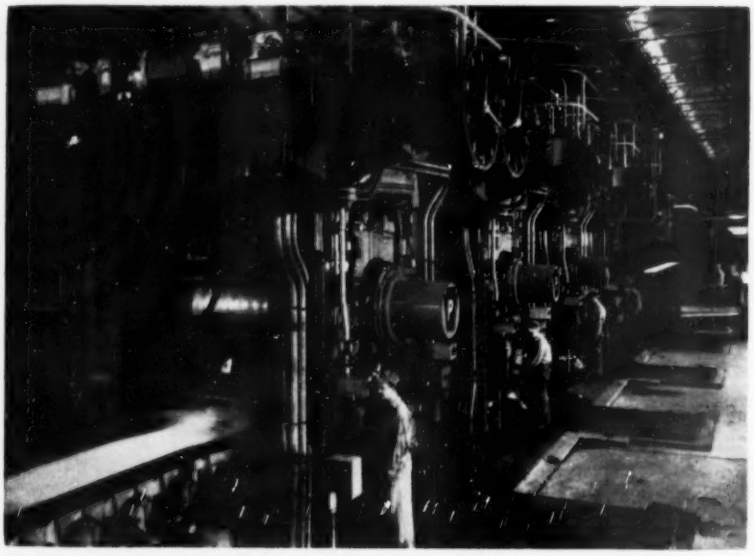
URGES REPEAL OF "BUY AMERICAN" ACT

NEW YORK — The "Buy American" Act is working at cross purposes with efforts to achieve economy in government, Rep Frank E Smith (D, Miss) told more than 100 members of the American Institute for Imported Steel, Inc, and the American Association of Machinery Importers, meeting here July 22.

"As long as it remains in force," he said, "we shall find we are on a treadmill in trying to progress toward economy in government buying." The total cost of the Act to taxpayers to date, he added, may be as much as $10 billion.

The free world needs more trade, not aid, Rep Smith said. And the Eisenhower administration has made it clear in official pronouncements that it regards the Act as injurious to US domestic and foreign policy.

Thus, he said, it is up to those who suffer from the Act's restrictive provisions to make a concerted effort to achieve its repeal. Rep Smith is author of a bill calling for repeal of "Buy American" legislation.



FOUR STANDS IN TANDEM FORM THE FINISHING TRAIN of Pittsburgh Steel Company's new 66-in. hot strip mill. Slabs 5-in. thick leave the furnace, pass through the descaling mill, then enter the reversing roughing mill (background, right), where they make five passes, emerging ½-in. thick. In these four stands, the slab is reduced to as little as 1/64 in., and may be a quarter-mile long. It is traveling to runout at left at about 20 mph. At the runout, it is cooled and descaled by water sprays, and then is passed on to a high-speed coiler. After it is cooled, it is gaged. Steel is then ready for shipping or for such further processing as hot or cold mill finishing

William E Kennedy Dies

WILLIAM E KENNEDY, assistant publisher of *American Machinist* and *Product Engineering*, died suddenly on July 13 in the McGraw-Hill offices in New York City. Widely known in metalworking and publishing circles, he had been planning to retire in November of this year, after he would have passed his 66th birthday and his 30th anniversary with *American Machinist*.

A graduate of the class of 1912 at Cornell University, Mr Kennedy came to McGraw-Hill in 1923 from the International Nickel Co where he had served many years as advertising manager. Following several years as district sales representative for *American Machinist*, he was appointed advertising sales manager in 1926. He became a strong advocate of establishment of a magazine strictly for designing engineers, and with the founding of *Product Engineering* in 1930 he became advertising sales manager of it as well as of *American Machinist*.

In 1943 Mr Kennedy was appointed general manager of the two magazines, and two years later was made assistant publisher, the position that he held up to the time of his death.

He was active in the American Gear Manufacturers' Association, serving for some time as program chairman. He was a familiar figure through the years at the meetings of the National Machine Tool Builders' Association. He also maintained close contact with the work of the Grinding Wheel Institute and the Abrasive Grain Association.

Mr Kennedy was a strong stabilizing force in the publishing policies of both *American Machinist* and *Product Engineering* and was a major factor in the success of those magazines.

He is survived by his wife, the former Hazel Mae Slade; two sons, Slade and William Jr; and a daughter, Marilyn (Mrs David E Bullard of Bridgeport, Conn). Slade Kennedy, an advertising representative for one of the McGraw-Hill publications, is currently serving as a first lieutenant in the Marine Corps, having been called back to active duty as a reserve officer. William Jr recently entered the engineering field.

Earl P Leeds

C A Woodley

L J Ely

J W Livingston

Names in the News

Earl P Leeds has resumed his former position as sales director milling machines for Brown & Sharpe Manufacturing Co, Providence, R I, after a leave of absence to serve as Director, Metalworking Equipment Division, National Production Authority, Washington, D. C.

Albert H Borchardt retired June 30 as vice president of Worthington Corp, Harrison, N J, after 44 years with the company. Mr Borchardt joined Worthington in 1909 after graduating with an ME from Columbia. He was for several years responsible for the sale of pumps.

Dean Weikart, formerly tool and product engineer at Rockwell Mfg Co's Crescent Machine Division, has been named chief engineer of the firm's Tupelo, Miss., plant.

Fred Duff, formerly New York district manager for Morse Twist Drill & Machine Co, New Bedford, Mass., has been appointed Chicago manager. Mr Duff will be succeeded in New York by **Rex Bennett.**

C A Woodley has been appointed manager of Caterpillar Tractor Co's Peoria, Ill, plant, and **L J Ely** manager of manufacturing for the plant. Mr Woodley, who started at 16 as a machine shop apprentice, has been with Caterpillar since 1926, has been general factory manager since 1950. Mr Ely has been with Caterpillar since 1916, when he started as a tool chaser, and since 1950 has been assistant general factory manager for Caterpillar.

Fred L Ball, one of the founders of the 46-year-old Park Drop Forge Co, Cleveland, has been elected president of the company, succeeding **George C Gordon,** president since 1910.

Carl J Westling has been appointed director of engineering for Salem-Brosius. Mr Westling joined the firm as chief engineer in 1951.

Richard G Ray, who will retain his responsibilities as plant superintendent of General Controls Co, Glendale, Calif., has been appointed vice president in charge of manufacturing.

J Warner Livingston has been named assistant general manager of Fairchild Engine & Airplane Corp's Stratos Division, Bay Shore, LI, N Y. Mr Livingston was formerly plant manager of Remington Rand's Eckert-Mauchly division.

Rear Admiral R A J English, USN (Ret), has been elected vice president in charge of engineering and production of American Pipe & Steel Corp. Admiral English, who was Naval War Plans Officer at Allied Headquarters in Algiers during World War II, has had wide engineering experience at various Naval industrial establishments. **L E Howard, Jr,** secretary and treasurer, and **Carl B Dahlberg,** vice president in charge of sales, were elected to the board of directors.

King DeSeve, formerly industrial relations manager of Warner Electric Brake & Clutch Co, Beloit, Wis, has been promoted to manager of manufacturing operations.

Lester N Blackford has been named sales manager, and **Earl A Goyeau** assistant sales manager of Progressive Welder Sales Co's Viking Division, Detroit.

Richard G Ray

Fred Duff

L N Blackford

E A Goyeau

Arthur F Murray

Jack Lewis

Ralph Edwards

Edward P Cody

Arthur F Murray, for 10 years works manager for Electrolux Corp, Old Greenwich, Conn., has been elected vice president in charge of manufacturing. Assisting him will be **G E Lofgren,** who will retain his position as director of research in addition to his new duties. Also promoted are: **F C Doughman,** chief engineer, to chief engineer and assistant director of research; **G W Norrick,** formerly assistant works manager, to director of equipment and methods; and **C M Harris,** formerly production manager, to director of production.

Victor A Olsen, who retired in 1952 as general manager of General Motors Corp's Detroit Transmission Division, has been named executive consultant to Hupp Corp and its subsidiary, Amgears, Inc.

Frank Gramm has been appointed Eastern regional sales manager for A O Smith Corp's Welding Products Division and will headquarter in Lancaster, Pa.

Rudolph Winters, foreman at Clearing Machine Corp's main plant in Chicago, has been named superintendent, Hamilton, Ohio, plant.

Jack Lewis, formerly chief production engineer, has been appointed vice president in charge of all production for the Hyster Co, including plants in the US and Europe.

James L McDowell, formerly superintendent of Standard Pressed Steel Co's Automatic Screw Machine Department, has been named manager of tooling and quality. Other personnel changes announced by the company are: **Herbert R Fesmire,** to succeed Mr McDowell as head of the automatics department; **Mark A Hawkins,** to general foreman of that department; **James B Snyder** to become chief accountant, succeeding **Charles F Roberts,** who with Mr. McDowell's predecessor, **Albert A Leedom,** has been transferred to SPSCo's Los Angeles subsidiary, Cooper Precision Products.

John C Walsh, formerly associated with Diemolding Corp, General Motors, Plomb Tool and Cherry Burrell Corp, has been named superintendent of US Hoffman Machinery Corp's Lamson St and Greenway Ave plants in Syracuse, NY. Also named by US Hoffman to a new post is **Leonard E Petzinger** as Cleveland area sales engineer.

Ralph Edwards has been named general sales manager — Machine Tools; and **Edward P Cody** general sales manager — Small Tools and Gages for Hanson-Whitney Co, Hartford, Conn. Mr Edwards, a veteran of 20 years in the machine tool industry, comes to Hanson-Whitney from Keller Tool Co, where he was New York manager. Mr Cody, who has been with Hanson-Whitney since 1924, was sales manager since 1948.

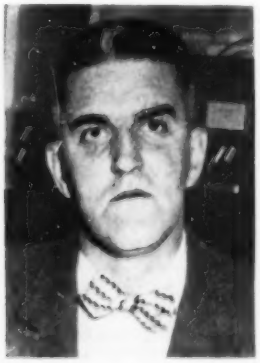
A W Kurz, Jr, vice president engineering, Hunt Loom & Machine Works, Greenville, S C, has been appointed vice president manufacturing and assistant to the president.

Stephen R Skrob has been appointed plant manager of Rheem Mfg Co's South Gate, Calif, plant. He was formerly works manager.

William F Jenkins has been appointed sales manager of Union Twist Drill Co's Butterfield Division, succeeding **L H Laythe,** who becomes office manager and sales consultant. **Blaine T Hall** will assist Mr Jenkins in Sales Promotion and Advertising, and **James T McFadgean** will manage Union Twist's new Customer Service Department.

Frank Gramm

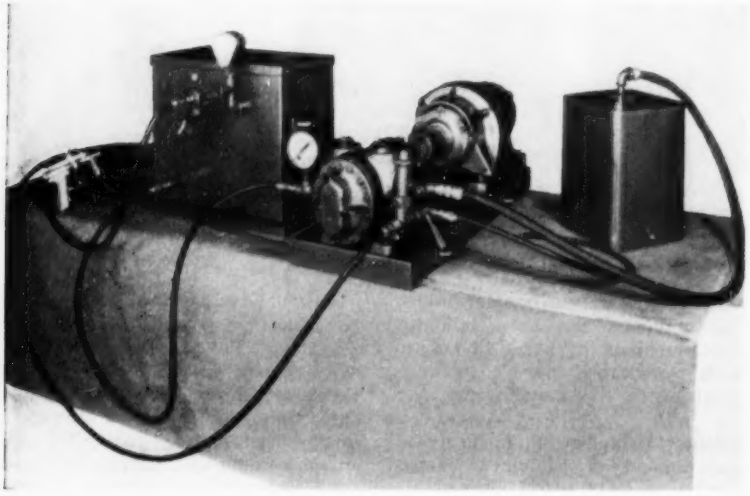
Rudolph Winters

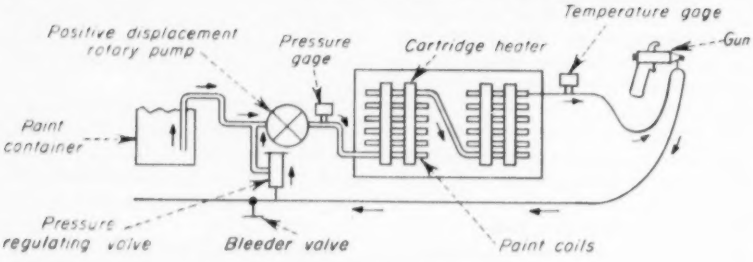


John C Walsh

William F Jenkins

New Shop Equipment





Hot Pressurized Paint Sprays Without Air Jet

Airless spray painting, a process whereby heated paint is sprayed by hydraulic pressure, has been developed by Bede Products, Inc. The paint is atomized by the sudden release of internal forces of expansion. One force is that of a liquid released through a properly restrictive nozzle. The other is vapor pressure. The finish is heated to such a temperature (180 to 200 F for synthetics, 160 for lacquers) that a fraction of the solvent content is brought close to the boiling point. Lacquers attain a vapor pressure of 5 to 7 psi above atmospheric, synthetics 8 to 12 psi. However, because the circuit is under pressure (from 300 to 600 psi), the solvents do not actually boil but burst into gas upon release to atmosphere. In effect, therefore, the solvent within the paint is being used as an atomizing agent.

Claimed as a major advantage of the system is the reduction in paint loss from overspray. Cold-spray loss may average 50% or higher, hot-spray loss, 40%. The airless-spray method reportedly results in losses ranging from 3 to 25%, depending on the object being painted. A major benefit claimed as a result of the cutdown on overspray is the reduction in health hazards. There is no paint-laden airstream rebounding into the operator's face.

Although a spray booth with slight exhaust is recommended, the need for a huge exhaust system is obviated. Because no paint particles are blown out of the building, water-wash systems can be eliminated.

In many cases, the process also results in an improved finish. Volume and angle of spray are controlled by nozzle selection, not by gun adjustment. A heavier film thickness can be achieved in one operation. This is because a heavier, higher-solid-content mixture can be sprayed and a greater percentage of solvent is dissipated from the atomized particles. Also, heated paint particles result in better flow-out with a higher gloss. Finally, only a slight amount of air is pulled across the freshly painted surface, reducing the dirt pickup.

Paint adhesion is reported to be highly improved. For one thing, the spray temperature is not reduced by a stream of air and hot particles result in better capillary action. The second factor is that the heated paint will dissolve minute quantities of oil or grease that may be on the surface and distribute them through the film, or float them to the top.

All equipment used in the Bede airless spray painting system is especially designed for the operation. Paint is pumped into the system, sent through the heater to the spray gun, and the unused portion recirculated through a pressure-regulating valve. Circulation constantly maintains hot paint at the nozzle.

The spray gun is virtually nothing but a trigger and is lighter than the conventional gun. As stated, spray performance is controlled by nozzle selection. Spray nozzles are available with varying degrees of fan width from 15 to 110°. Teflon packing is used in the spray gun.

The pump, with a 1-gpm capacity, is driven by ¾-hp, 1-, 2-, or 3-phase, 110-, 220-, or 440-v ac motor (explosion proof). Capacity of the 4-kw heater is 20-24 gph. Both heater and pump are approved by Underwriters Laboratory for hazardous location.

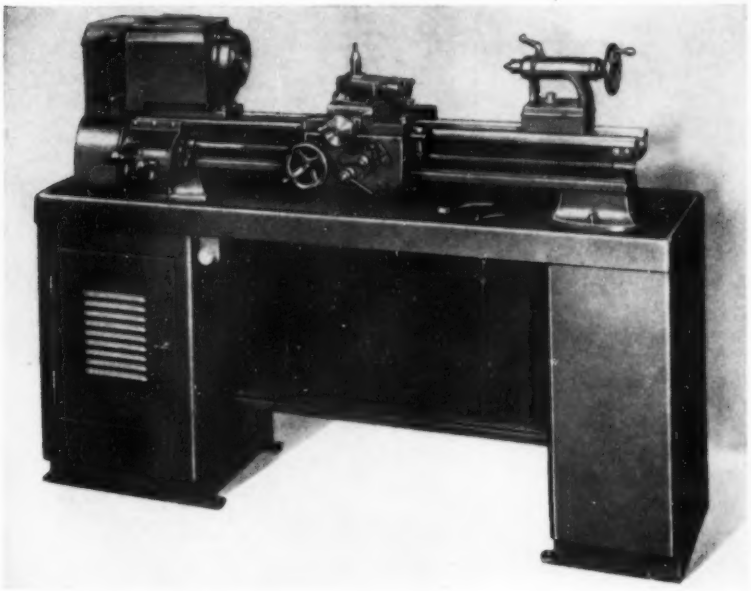
To stand the high pressures and hot solvents, the hose is especially designed and is lighter and more flexible than the conventional fluid hose. It has a ¼-in. OD and will stand bursting tests of 3000 psi.

Airless spray painting can be used successfully for many applications that formerly required brush painting, according to the maker.

Lacquers, synthetics, wrinkles, varnishes, and other types of finishes can be sprayed. Paint can be made as thin or heavy-bodied as desired. However, lacquer shows a strong tendency to pinhole unless the solvents have been carefully adjusted. And, although the two-coat hammer finish is successful, the problem of the one-coat hammer finish has not as yet been solved.

Bede Industrial Products, Inc, 1110 Brookpark Road, Cleveland 9, Ohio

Materials and Parts



Logan 12-in. Lathe Features Rugged Design

Lathe has heavy headstock, twin V-belt outboard drive, and ball-bearing-mounted spindle with 16 speeds from 38 to 1260 rpm. It has 12-in. swing-over bed; 1-in. collet; 1⅜-in. spindle hole; center distances of 23 and 35 in.

Rugged carriage features lever-operated disk-type clutch. Cross-slide and saddle have precision-ground top surfaces. Bed is heavily ribbed; V-ways and flat ways are precision ground to tolerance of 0.0005 in.

Logan Engineering Co. Lawrence and Lamon Ave, Chicago 30, Ill

Turret Indexing Units For Automatic Machines

Swanson standard, intermittent-motion, turret indexing units were designed to provide a basic packaged chassis for a wide variety of special automatic machines. Units are available with turret diameters of 20, 30, or 40 in., for mounting 16, 24, or 32 work stations. Indexing rates are from 547 to 4700 indexes per hour and dwell time may vary from 0.5 4.9 sec.

Indexing is accomplished by means of a uniform-acceleration, cross-over cam. Locking device assures positive and accurate location at all work stations.

Mounting ring with radial keyway is provided below face of turret for fastening mounting brackets. Brackets may be fastened in any position around turret and are furnished in a variety of widths to support any type of operational device. Stationary center plate, recessed in top of turret, provides additional means of mounting or supporting operational devices.

Totally enclosed, fabricated steel base rigidly supports index box and turret and encloses motor drive.

Swanson Tool & Machine Products, Inc, Erie, Pa

...INCLUDING

Surface grinder, made by popular manufacturer of vertical milling machines, has 12-in. capacity page 166

Straight - sided, double - crank press with 525-ton capacity has two-station, electrically controlled clutch with spring-loaded brake page 166

Automatic copying lathe has hydraulic carriage feed and spindle speed range from 380 to 3000 rpm page 168

Corrosion-resistant stainless steel alloy is non-galling and does not overage at elevated temperatures page 170

Centerless grinder incorporates attachment adapting it for production grinding of rotors and rotor shafts for small electric motors page 172

Milling cutter has replaceable blades seated on cutter periphery against an abutment that takes cutting forces page 174

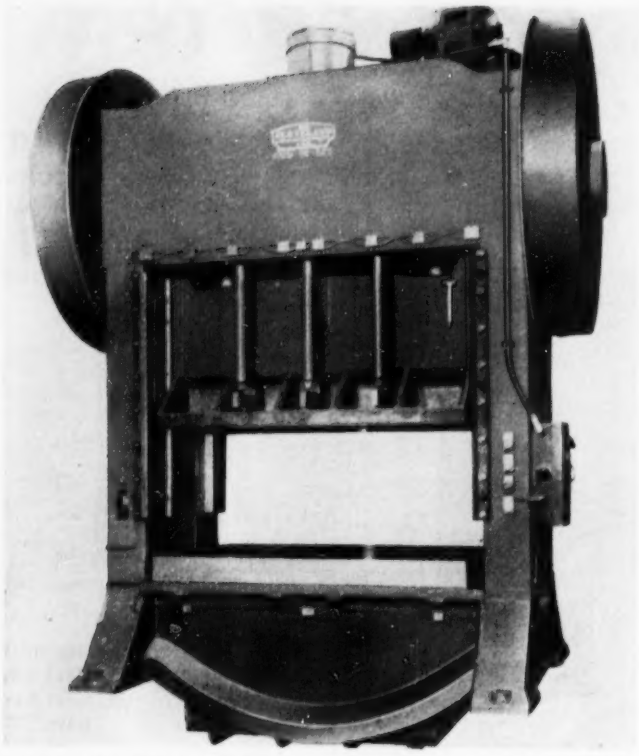
Self-locking chucks eliminate use of adapters page 176

Cartridge case-marking machine eliminates use of hydraulic presses with capacities as high as 50 tons page 176

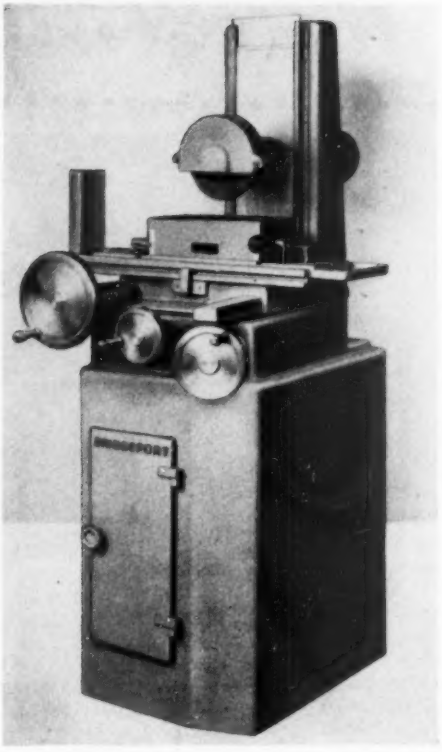
...and in Aug 17

Laminated plastic ball bearing retainers make it possible for precision bearings to attain in excess of 100,000 rpm.

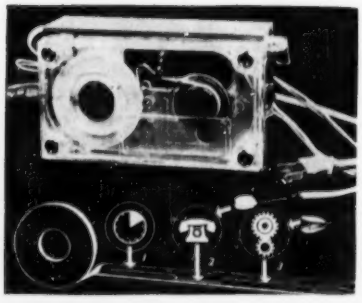
Bar machine has two independent spindles; stock and drill are simultaneously rotated in opposite directions.



CLEVELAND STRAIGHT-SIDED DOUBLE-CRANK PRESS, double geared, twin drive, equipped with two-station, electrically controlled, air-operated drum-type clutch with spring-loaded brake. Slide has air counterbalance, and flywheel has auxiliary air brake. Bed incorporates 91-ton pneumatic cushion in two units with air manifold controls. Stroke is 16 in.; adjustment to slide, 12 in.; distance from bed to slide, 32 in.; bed and slide area, 60x96 in.; capacity, 525 tons. Drive is supplied by multiple V-belts from motor to flywheel—*The Cleveland Punch & Shear Works Co, Cleveland 14, Ohio*



BRIDGEPORT SURFACE GRINDER with 6x12-in. table has 13-in. capacity under the wheel and takes a standard 7x½x1¼-in. wheel. Spindle (Pope, Excello, or Whiton) incorporates motorized anti-friction ball and roller bearing. Flat and V-ways are hand scraped. Handwheels are graduated to 0.001 in. Spindle speed is 3500 rpm — *Bridgeport Grinding Machine Co, 315 Asylum St, Bridgeport, Conn*



Monitoring Unit Records Time-Rate History

Alden magazine recorder prints and stores tape record of two separate data traces plus a timing trace. Installation of tiny switch at the on-off action to be recorded enables the tape channel to be marked as the action occurs or ceases. Machine operation and downtime is an important field to which recorder can be applied, but any on-off phenomena can be traced. A few examples are: timing of opening and closing of relays, timing of relay burn-out, counting of number of times machine was used.

Recording tape consists of Alfax electrosensitive paper which is marked by low-power electricity. Tape drive is furnished in varying speeds so that one magazine loading of tape will run for as long as eight days—or can be run through in hours where minutely detailed record is desired. Sensitivity of tape is such that actions separated by as little as 1/6-sec duration are positively recorded. Drive mechanisms of various speeds are built as plug-in units which are interchangeable within the drive unit to change speed.

Tape and recorder mechanism are contained in the magazine which is a separate unit that plugs onto the drive unit—thus supply of tape can be quickly replenished in the field.

Basic operation is simple. Paper tape moves under tiny styli actuated by normally-open or normally-closed switches which make or break the marking current as monitored actions go on or off. Either one or both channels can be used. Back of the takeup reel has tiny bosses which operate as internal switches providing timing mark signals on third channel.

Power to drive the tape reels and mark the tape is supplied from one connection to 110-v outlet.

Alden Electronic and Impulse Recording Equipment Co, Westboro, Mass

Fork Truck Side Shifter

Side Shifter is a permanent attachment for use with any L-S Space-Master electric fork truck, enabling operator to move load along the horizontal plane without moving truck. All controls are from operator's cab position. Loads can be shifted 4 in. to either side of the center position.

Lewis-Shepard, Dept R-22, Watertown, Mass

SIDNEY LATHES

ARE JUST RIGHT FOR YOUR

LARGER TRACER JOBS, TOO

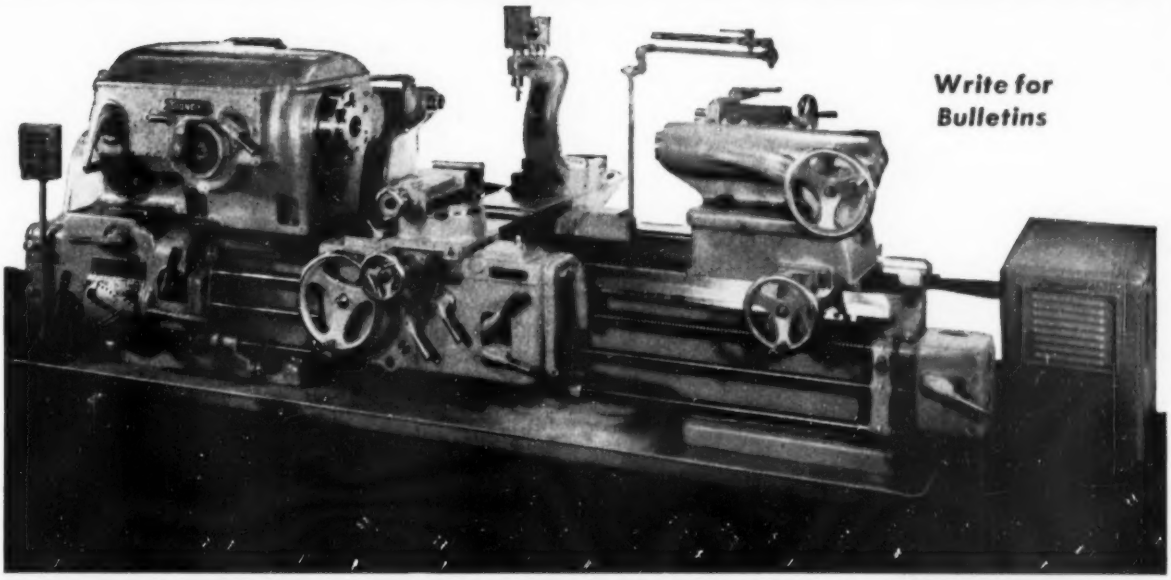
25" TRACER LATHE RAISED TO SWING 33½"

SIDNEY LATHES OFFER THE PERFECT COMBINATION OF RUGGEDNESS & SENSITIVITY

RUGGEDNESS AND BRUTE STRENGTH . . . for heaviest cuts and to withstand the most severe strains, power transmitting elements are made of unusually large proportions of finest, heat treated and hardened materials.

DELICATE SENSITIVITY . . . the Sidney FLUID TRACER permits unlimited reproduction, true to form in every detail.

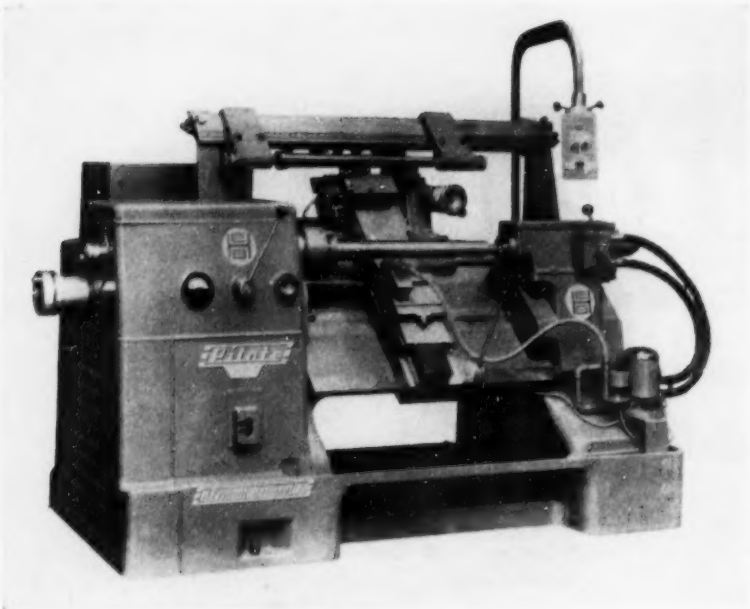
SIDNEY LATHES ASSURE FAST, ECONOMICAL PRODUCTION EVEN ON TOUGHEST TYPES OF WORK



Write for Bulletins

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904



French Automatic Copying Lathe Features Hydraulic Carriage Feed

H E B Pilote, developed and produced in France by H Ernault Batignolles, equipped with hydraulic carriage feed, is claimed to be the first completely automatic hydraulic copying lathe. After loading, cycle is started with pushbutton and when part is finished, tool returns to starting position and spindle stops.

Advantages claimed are: rapid machining of parts using one unskilled operator to feed several machines; setup can be completely changed in less than an hour; tooling is simple and cheap and there are no careful adjustments to be made; both roughing and finishing may be carried out at the same operation; machine is equally suitable for first or second operations and is expected to replace chucking machines for many purposes; machine may be arranged to do boring and outside turning at the same operation.

Cross-slide is arranged at 90° to bed and provided with slots to enable it to be equipped with both front and back tools as well as a boring bar. Transverse motion is hydraulically controlled by the copying device which follows a flat templet fixed in an indexing drum designed to carry eight templets. Front and back tools may both be used for copyturning, using different templet for each cut. Back tools can also be arranged for plunge cutting automatically as for turning a groove or undercut. In addition, back tools may be used for taking a light finishing cut using the Z stop which enables tolerances of 0.0005 in. to be maintained on production runs. It is said that because of the rigidity of the machine, surface finish of better than 32 mu in. may be maintained.

Longitudinal motion of the carriage feed is derived from a ram under hydraulic pressure obtained from a pump mounted in the base, which also actuates the hydraulic tailstock. H E B claims to have developed their own design which insures that the feed per revolution of the spindle remains absolutely as set regardless of the resistance met by the cutting tool, the temperature and viscosity of the oil, or the actual spindle rpm. This is obtained by a controlling leadscrew which opens and closes the valve as necessary, yet the force between carriage and leadscrew is only a few ounces.

Feed of the unit may be reduced at any predetermined point to yield a fine finish. Fast feed and return of the carriage (27 fpm) reduces idle time. When copying square shoulders the feed is automatically declutched while the tool feeds out.

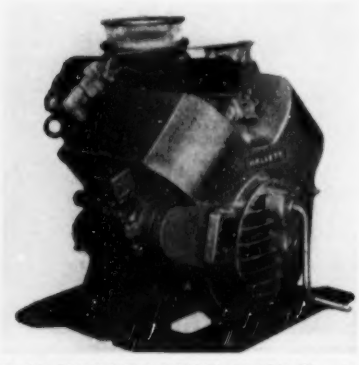
Machine may also be fitted with one or two infeed attachments for undercutting or facing. Feed on these is also hydraulic and said to be absolutely uniform, even when taking heavy cuts, making them suitable for facing deep flanges.

Machine is normally fitted with a 20-hp motor and has spindle-speed range of 380 to 3000 rpm. Feed range is from 0.0015 to 0.035 in. Lubrication of ways and cross-slide is automatic; headstock is lubricated by gear pump. An ammeter enables the machine to be operated at max output.

Model 51 will swing 14-in.-dia circle over the bed and 7-in. dia over the cross-slide. Max center distance is 30 in. Spindle bore is 2 in. and bar feed attachment is available. Spindle nose is standard A 1-6.

Model 76 is a larger machine with 3-in. spindle bore and capability of swinging 15⅜ in. circle over the bed and 8¼ in. over cross-slide.

Imported by H E B Machine Tools, Inc, 475 Fifth Ave, New York 17, NY

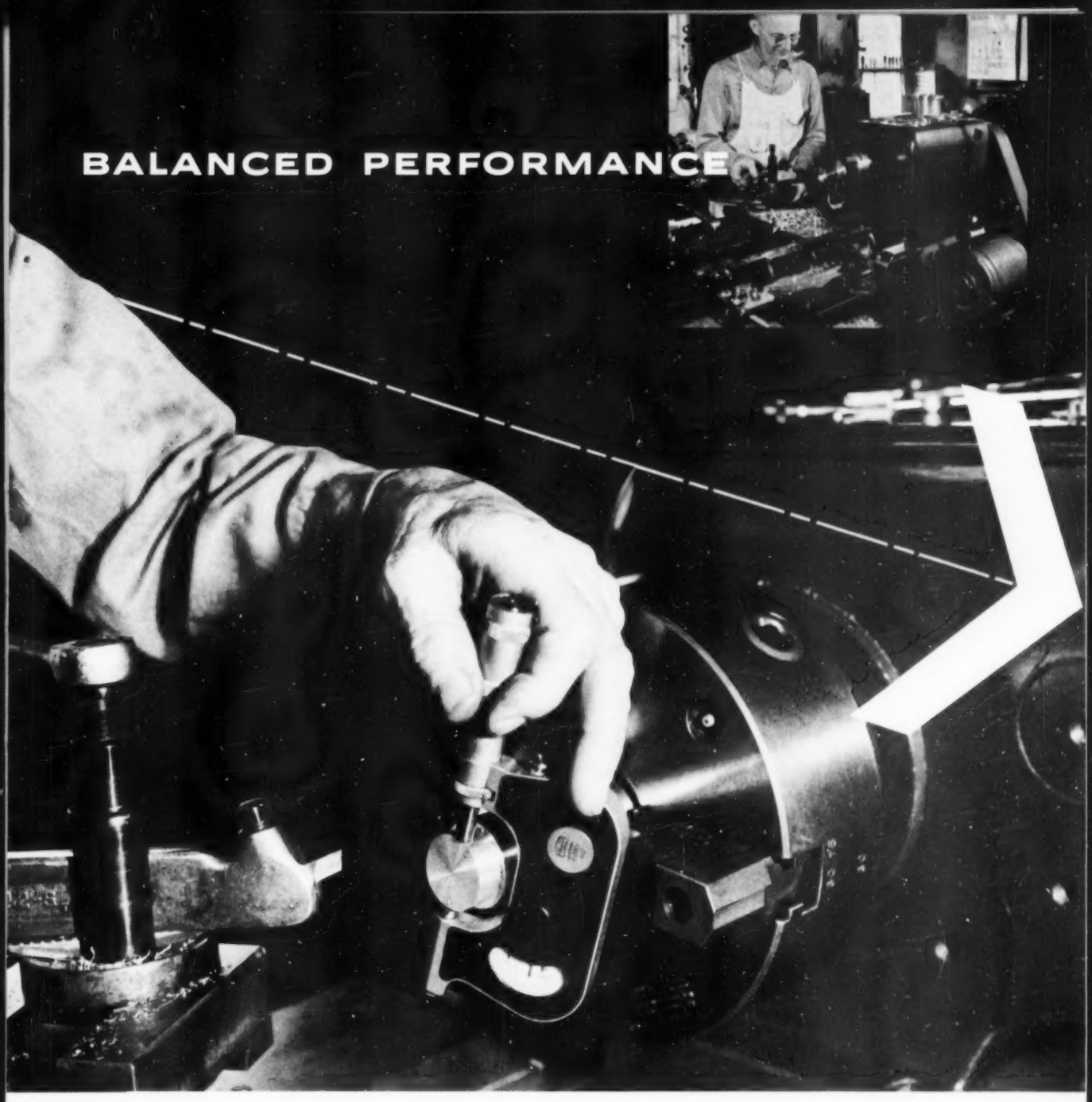


TWO-CYLINDER DIESEL ENGINE, air-cooled, model AC-2, develops 13 hp for continuous load, 14 hp for intermittent duty. Specifications are: 3½-in. bore, 3¾-in. stroke, 36.07 cu in. displacement per cylinder, 20 to 1 compression ratio, and weight, 25 lb per hp — *Hallet Mfg Co, Inglewood, Calif*

Vibration and Noise Isolator

Barrymount type 915 vibration and noise isolator was designed to provide efficient isolation at frequencies above 20 cps for equipment applying static loads of 15 to 200 lb per unit isolator. When loaded within recommended range, unit will reportedly provide from 70 to 90% isolation at 30 cps and more at higher frequencies.

The Barry Corp, 700 Pleasant St, Watertown 72, Mass



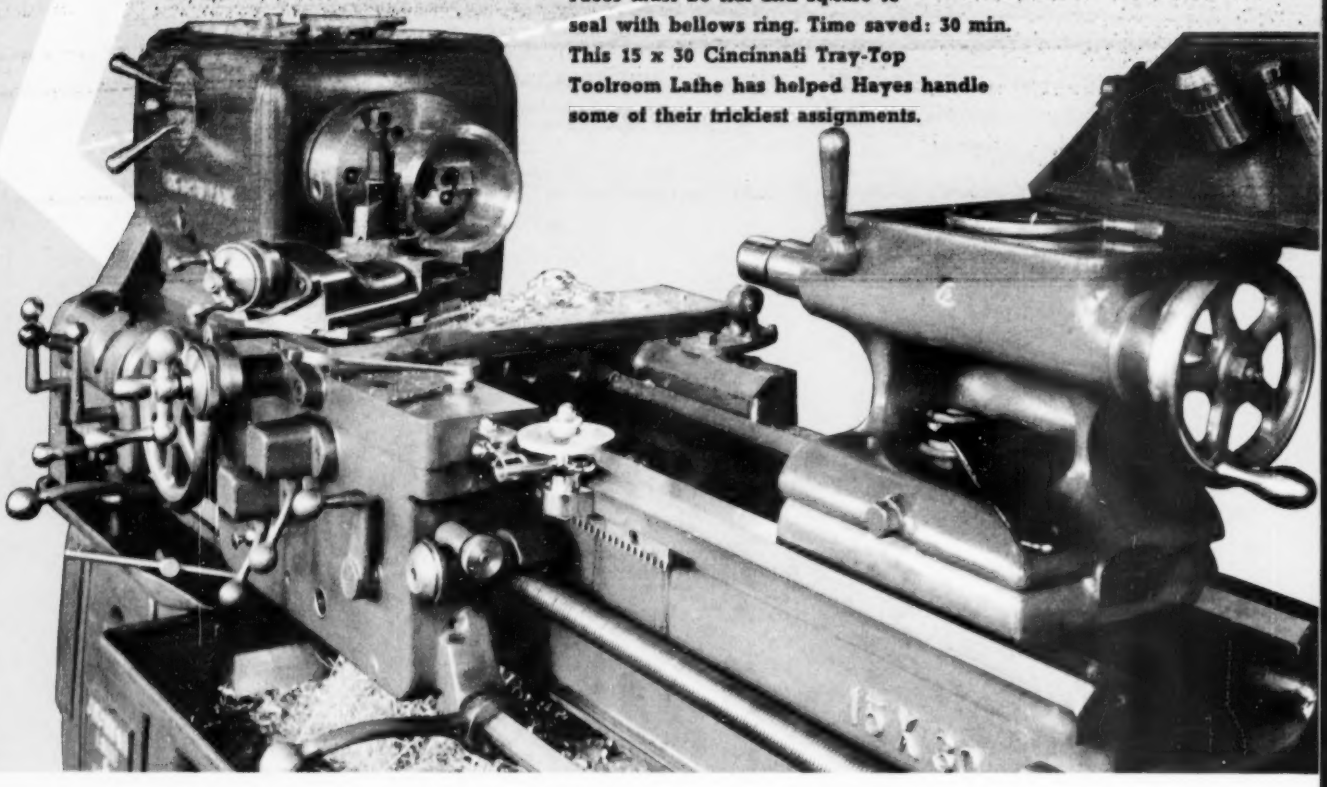
Hayes Scientific Appliances, Urbana, Illinois, often checks work done on their Cincinnati Tray-Top Toolroom Lathe with Zeiss Micrometers, and gets results consistent with inspections with gage blocks on a comparator! This, we think, is dramatic proof that you can do fancy lathe work on Cincinnati Tray-Tops at un-fancy prices. Ask your nearby dealer to show how and why balanced design Cincinnati Tray-Tops deliver important bonuses in precision as well as production.

best buys in their class!

CINTI LATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

PRECISION PLUS | AND LOW COST



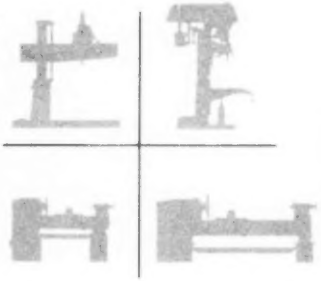
The part: bronze cap for vapor condenser, made by Hayes Scientific Appliances. Tolerances: fit to cylinder within .0003. Faces must be flat and square to seal with bellows ring. Time saved: 30 min. This 15 x 30 Cincinnati Tray-Top Toolroom Lathe has helped Hayes handle some of their trickiest assignments.

CINTILATHES: The complete, balanced line;
Tray-Top for light duty (engine, toolroom and gap bed models);
10", 12½", 15", 18" sizes; 18" to 114" center distances.
Model LT for medium duty (engine and gap bed models).
16", 18", 20", 24" sizes; 30" to 264" center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

CINTILATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.



PRINTED IN U. S. A.

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Three types of tool steel solve most hot-work problems

Hot-work tool steels which contain large amounts of either tungsten or molybdenum have high "red-hardness." In other words, they withstand very high operating temperatures without softening.

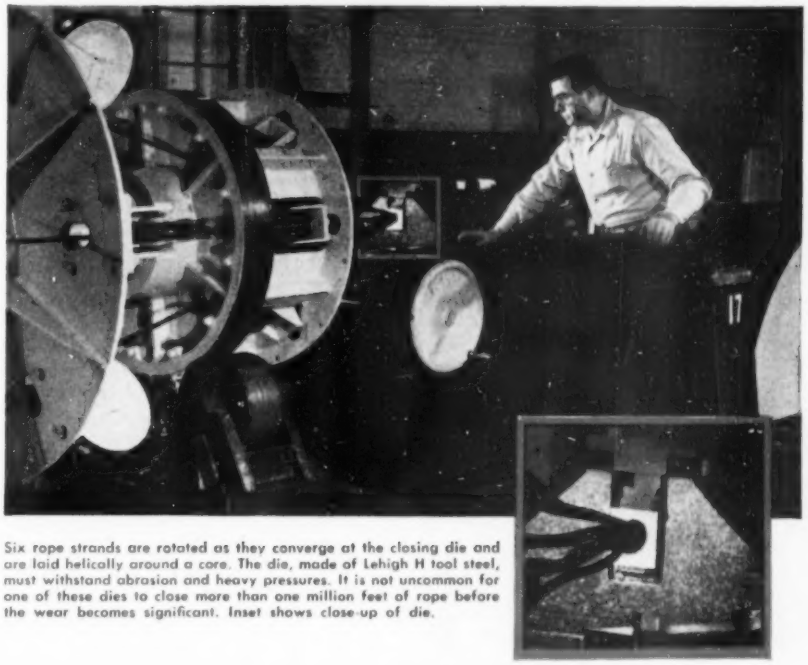
Although these steels have excellent wear-resistance, they cannot be subjected to drastic water-cooling while in operation because this results in excessive "heat-checking." Caused by repeated thermal stress, this condition shortens their service life. The 8½-pct-molybdenum type (our Hot-Work 8) is better in this respect than the 9-pct-tungsten type (our 57 Hot-Work).

One way to prevent excessive temperature build-up, in repetitive operations where water-cooling is not used, is to provide duplicate tools which can be used alternately in the operation. This arrangement makes possible a longer cooling time between operations than if only one tool is used.

Whenever the nature of the hot-work operation is such that water-cooling of the tool is practical, it is often best to use one of the 5-pct-chromium types of hot-work steel—such as our chrome-moly-tungsten (Cr-Mo-W) and chrome-moly-vanadium (Cr-Mo-V) grades. The cooling prevents loss of hardness due to high temperature.

Although they have lower red-hardness, the 5-pct-chromium grades are good choices for tools and dies which involve both shock and hot-metal contact.

Operated in a 400-ton press, this punch is made of Bethlehem Cr-Mo-W tool steel. It extrudes steel slugs heated to 1950 F in the making of rock bits.



Six rope strands are rotated as they converge at the closing die and are laid helically around a core. The die, made of Lehigh H tool steel, must withstand abrasion and heavy pressures. It is not uncommon for one of these dies to close more than one million feet of rope before the wear becomes significant. Inset shows close-up of die.

Wire rope "closed" by long-wearing dies of LEHIGH H tool steel

One of the vital steps in the making of wire rope is the "closing" operation which arranges the rope strands compactly in a helical position around a core of either hemp or steel wire.

Closing dies are subject to considerable abrasion by the rotating strands as they converge at the die and pass through, at the same time being laid into accurate position. Lehigh H is ideal for this application because its high-carbon, high-chromium composition gives it extreme long-wearing properties. When the dies eventually become worn, they are usually refinished for use in closing rope of a larger diameter.

Made in two pieces, closing dies are machined to accurate size, heat-treated to a hardness of about Rockwell C-61; then they are ground and polished to avoid damage to the wearing surfaces.

Because of its air-hardening characteristics, Lehigh H is subject to only the minimum amount of distortion during heat-treatment—an important feature wherever accuracy is essential.

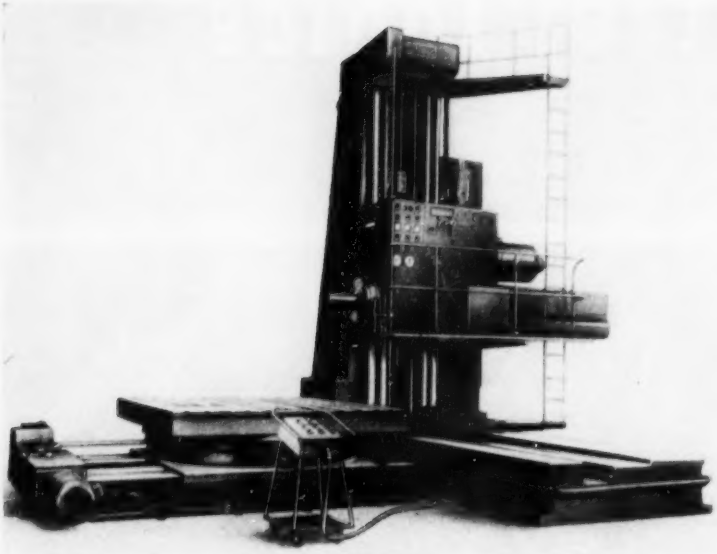
BETHLEHEM TOOL STEEL ENGINEER SAYS:

Avoid sharp-cornered keyways

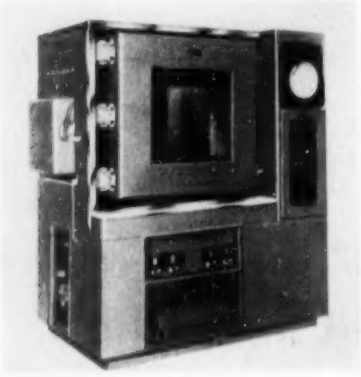
Keyways with sharp corners are the cause of many shaft failures. Fundamentally, this type of breakage is a fatigue-failure due to excessive stress-concentration at the sharp corners.

The cure for failures of this kind is to make keyways of half-round design and use a round key in the assembly.

Of course, the fact that stresses are low often prevents the failure of shafts with square keyways; and so this design continues to be used. But that does not alter the fact that a square keyway on a shaft is a basic design fault.



HORIZONTAL BORING AND MILLING MACHINE has gear drive for roughing and belt drive for finishing.—Standard sizes include spindle diameters from 6¼ to 12⅜ in. — *Imported by American Schiess Corp, 205 E 42nd St, New York 17, NY*



Temperature and Humidity Test Chamber

Test chambers have a temperature range from −130 to +200 F and a standard humidity cycle of 20 to 95% between 35 and 185 F. Space capacity ranges from 4 to 36 cu ft in five models.

Forced air circulation system maintains inner temperature variation at a minimum. Test spaces are stainless steel and include four ⅝-in.-ID sleeved openings for introduction of electric leads and hydraulic lines. Electric defrost system prevents condensation on test items by increasing their temperature to ambient before removal from test space.

Electrical system with separately fused major circuits is monitored by individual pilot lights and switches mounted on master control panel. Compressor safety switches, overload protectors, and automatic pump down control are standard features.

Refrigeration system is composed of heavy-duty, water-cooled, hermetically sealed compressor-motor assembly of standard make. Cooling coils are copper with welded connections; design incorporates high ratio of prime to secondary surface to eliminate possibility of oil trapping.

Murphy & Miller, Inc, 1326 S Michigan Ave, Chicago, Ill

Blue-White Granite Surface Plates Added by Taft-Peirce

Taft-Peirce has added blue-white granite surface plates to its line of inspection and layout equipment. Angle of grain to working surface is 45°, minimizing possibility of chipping or plate breakage.

Non-abrasive, non-magnetic surface is easily cleaned with ordinary solvents. Because of extremely close grain and low moisture absorption, tools or work left on the unit are not subject to rust.

Taft-Peirce Manufacturing Co, Woonsocket, RI

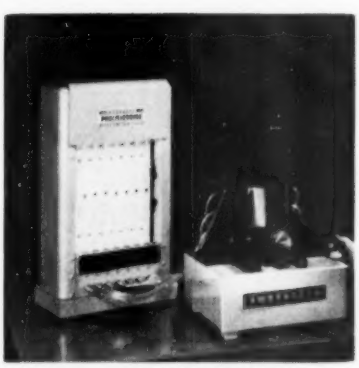
Stainless Steel Has Non-Galling Corrosion-Resistant Properties

Cooper Alloy has developed a stainless alloy, V2B, which is a hardenable 18-8 type of stainless steel containing copper, molybdenum, silicon, and a small amount of beryllium.

Qualities claimed for V2B are: (1) It is readily machinable in the quench-annealed state and may be hardened by low-temperature heat treatment which produces no distortion and only slight tinting. (2) In the annealed condition, material is easily welded using special welding rods. (3) In addition to its use in a variety of corrosive applications where its high-hardness and non-galling features are required, V2B does not overage at elevated temperatures and may be used at temperatures up to 1400 F.

V2B may be readily produced in both cast and wrought form.

The Cooper Alloy Foundry Co, Hillside, NJ



Air Gage Assembly Checks Bucket Blade Dimensions

Air gage assembly for simultaneous checking of critical dimensions on jet engine turbine bucket blades has been introduced by Sheffield. An unskilled operator can check blade taper in relation to root form at three places along the leading and trailing edges and measure root form length in a single step.

Assembly consists of a blade-positioning fixture with seven Plunjet gaging cartridges and a seven-column Precisionaire. Relative position between the Plunjet at the root form and those along one edge of blade is always the same because cartridges are positioned in a floating arm. Thus, a variation in root length, providing it is within tolerance, does not prevent accurate inspection of taper.

Each cartridge has glass column and float for indication of whether or not dimension is acceptable.

Sheffield Corp, Dayton 1, Ohio

TO MAKE HEAVY-DUTY COPPER

Gaskets

USE REVERE DEOXIDIZED

Tube!

Diesel Fuel Injection Pump, made by American Bosch Corp., Springfield, Mass., and gaskets made by cutting rings off 2" deoxidized copper tube.

• An important extra service rendered by Revere consists of collaboration in setting up specifications. This is valuable because there are many different Revere Metals, each with special characteristics. No one copper, for example, will serve to best advantage in every application. A case in point is the matter of copper gaskets for Diesel fuel injection pumps. Copper is of course an ideal metal for gaskets, and is widely used for that purpose. But for this special application, which copper and in what form? The pump is used on large engines for municipal generating plants. It weighs 186 pounds, and must produce the high pressure required to inject fuel near the top of the Diesel compression stroke. Naturally, the load is a pulsating one. American Bosch Corporation came to Revere with the problem. Our suggestion was that much scrap could be saved if the gaskets were made by cutting rings off copper tube, instead of stamping them from strip. This achieved a double purpose, since the tube is made of deoxidized copper, which is superior in this application to electrolytic. We are able to report that these recommendations proved successful. . . . This work was done by the Revere Technical Advisory Service. To get in touch with it, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

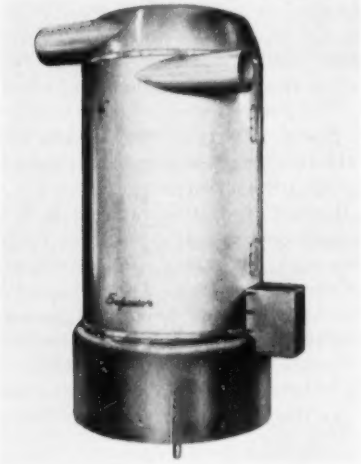
SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION, SUNDAYS

Roddick Extracting Tool

Extracting tool removes threaded broken parts without wedging them in place and is made to work with any fitting in the pipe, hydraulic, aircraft, plumbing, or mechanical fields. Tool is available in range of 20 sizes; sizes ⅛ to ⅞ by 1/32 in. complete the line.

Extractor is designed to form teeth inside the hole until the shoulder contacts the part and permits a high torque without expanding the part. Tool has large hexagon head.

Roddick Tool Co, Anaheim, Calif



Air Centrifuge for Dust Removal and Particle Recovery

Superior air centrifuge works on impelled centrifuge principle and is adaptable to plant airflow systems wherever industrial processes involve machines such as grinders, pulverizers, dryers, roll stands, purifiers, solvent extractors, mixers, open conveyors, and blenders.

Unit is 7 ft high and has 42-in. dia; smaller machine is available for laboratory use.

Dust-laden air enters tangentially at relatively high velocity and is accelerated by perforated rotor. When air reaches rotor surface speed, it moves into rotor through perforations. Rotor is tapered so that course of least resistance is downward.

Some solid particles separate from the air and remain in the space between rotor and housing until they drop to bottom of housing where they are swept to the solids outlet.

System blower propels air upward to outlet tube; since dia of tube is smaller than dia of rotor where air enters, pattern of moving air is funnel-shaped and air stream achieves increasing angular velocity.

Finer particles are separated from the air and passed through the rotor perforations into space. Clean air moves through outlet tube into the bonnet from which it is discharged.

Superior Separator Co, Hopkins, Minn

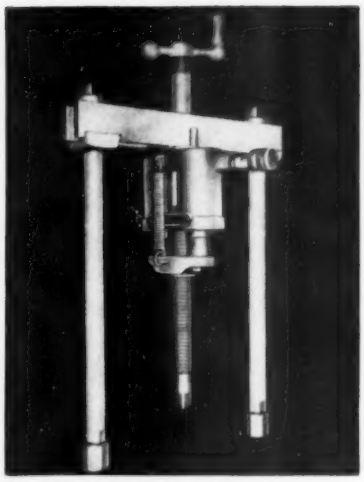
German Centerless Grinder Grinds Small Electric Motor Rotors

Herminghausen Centerless Grinder, model SR 30, incorporates an attachment which adapts it for production grinding of rotors and rotor shafts for small electric motors. Max capacity is shafts of 1¼-in. capacity. Rotors and shafts are introduced into the grinder by feed arm. Grinding wheel and feed wheel are split. One part of the grinding wheel grinds the cylindrical portion of the shaft and the other part, dressed with a step, grinds the pointed end.

Two flanges of slightly smaller OD than the rotor are slipped on the shaft ends. A driving pin on each of them engages a hole which is stamped in some of the top layer laminations. Then the whole assembly is introduced into the grinder as shown.

Other models are available with ⅝- and 4-in. dia capacities. All machines are available for infeed or throughfeed.

Imported by Eric R Bachmann Co, 27-11 41st Ave, Long Island City 1, NY



OTC Adapts Hydraulic Rams To Push-Pullers

OTC Power-Twin center-hole hydraulic rams have been adapted to the OTC push-puller. Four sizes of push-pullers with complete assortment of attachments and adapters can now be used with hydraulic power to speed up maintenance pulling and installing operations involving gears, bearings, sheaves, pulleys, pinions, and couplings. Capacities from 17.5 to 50 tons are available.

Users already having an OTC push-puller may adapt it for use with the center-hole ram with an attaching plate.

Owatonna Tool Co, 383 Cedar St, Owatonna, Minn

Magnetic Welding Clamps

Aronson magnetic clamps, with Alcomax permanent cores, are used to locate and hold two pieces of metal together for tacking or welding.

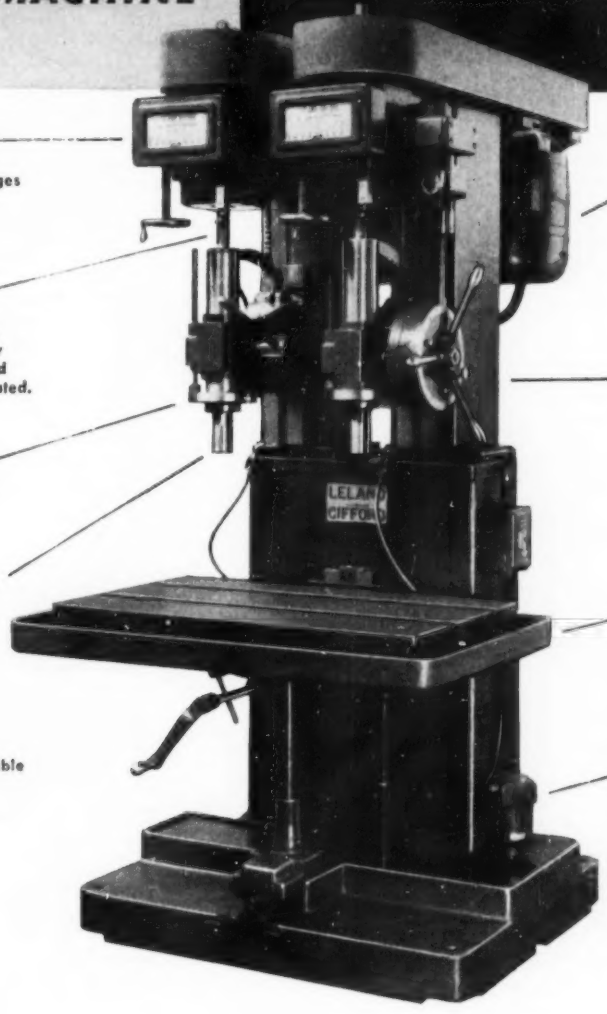
Three models are available. MCP, 45° ends and plain periphery, holds flats to flats. MCV, V-ends and plain on top and bottom, holds rounds to rounds, flats to rounds, or flats to flats. MCA is adjustable to any angle; two attached magnets have a link on either side held with a thumbscrew. This model will hold light sheet metal at any angle.

Aronson Machine Co, Arcade, NY

ALL THE FEATURES YOU WANT IN A HEAVY DUTY DRILLING MACHINE

the new

LELAND-GIFFORD No. 3 MVB



Leland-Gifford indicating shift for instant speed changes without stopping machine.

20-tooth involute spline spindle for greater rigidity, less wear. Independently counterbalanced and continuously lubricated.

Flanged quill for mounting multiple (spindle) heads.

Capacity of No. 3 or No. 4 Morse Taper.

Base, column and table ruggedly built for maximum rigidity.

Totally enclosed, fan cooled, ball bearing NEMA motor mounted at rear and driving through V belts.

Semi-automatic power feed with 3 feed rates, automatic adjustable depth stop and safety slip clutch. Hand or hydraulic feed also available.

New design table with removable top for easy refinishing.

Coolant pump and tank readily accessible for cleaning.

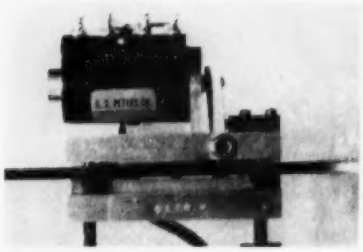
24" SWING
1 to 4 SPINDLES

Write For Complete Information

LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Extensometer Records Elastic Deformation of Sheet Metal

Extensometer can be used on specimens of ½-in. width, 0.005- to 0.25-in. thickness; magnifications of 250, 500, and 1000 are obtainable over a measuring range of 0.04 in. with suitable recording equipment.

Unit consists of pair of Dural channel sections, each supporting one of the two clamping contact points at opposite ends of the gage length. Hard points are on back of thumbscrews which clamp specimen against flat anvils. Two extensometer sections roll over each other on pair of hard steel balls and are held together by compression spring. Sections are brought together longitudinally by light pressure to establish correct gage length before clamping them on specimen.

Coil and core are so supported that relative movement of sections changes position of core in coil.

Baldwin-Lima-Hamilton Corp, Philadelphia 42, Pa

Floating Barrel Nut Is Self-Aligning

Self-locking Flo-Nutt, used wherever conventional barrel nuts are employed, eliminates milling of large recesses for wrench clearance and is self-aligning. Holes drilled for the nut may reportedly be held to closer tolerances, assuring full bearing of the barrel to the fitting.

In cases where a number of matched drilled holes in one pattern are required, Flo-Nutt is said to save tooling expense as looser limits of the bolt hole can be set up with a variance of 1/64 in. in any direction because of the floating feature which allows the nut to shift within the barrel.

Flo-Nutt has an anodized aluminum alloy body with cadmium-plated steel retainer; available in range of bolt sizes from ¼-28 to 1½-12 with minimum tensile strength of 5,760 to 272,000 lb.

A A Metal Products, Inc, 6200 S Central Ave, Los Angeles 1, Calif

Platform Lift Replaces Inclined Belt Conveyor

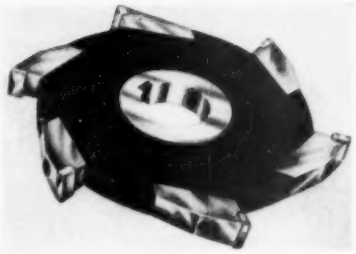
Rapistan platform lift, for moving materials from floor to floor where limited space prohibits use of inclined belt conveyor, will raise and lower 800 lb at standard 15 fpm or 300 lb at 30 fpm. Platform can be lowered to within 6½ in. above floor level and raised to a top height of 20 ft. Limit switches are adjustable to accurately stop the platform at any point within range of travel.

Standard steel platform size is 24x30 in., but smaller and larger models are available. Platform carriage travels on four V-track wheels enclosed in steel-channel-side frames.

Automatic safety lock prevents carriage from dropping in event of cable failure. Angle-iron brackets with pierced holes are provided for lagging the low end of the unit to the floor.

Unit has electric hoist mechanism totally enclosed and is available with variety of motor types.

The Rapids-Standard Co, Inc, Dept VL, 342 Rapistan Bldg, Grand Rapids 2, Mich

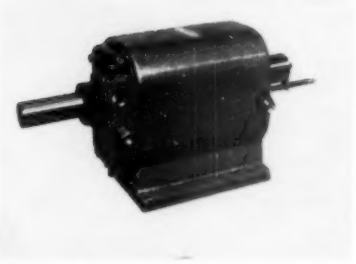


Millit Milling Cutters Feature Attached Blades

Complementing the solid-body and inserted-blade types of milling cutters is an attached blade cutter claiming extreme blade rigidity. Replaceable blades are seated on the periphery of the cutter body against an abutment that takes all cutting forces. Blades are accurately doweled in place at two points. Capscrew shank dowels into a reamed hole to locate the blade and combines with the conical seat to accurately cam the blade back against the body abutment. A dowel through the body abutment holds a slot in the tail of the blade and accurately locates the tail laterally.

Rake and shear angles are built into the blade instead of the body slot. Choice is provided of carbide, HSS, or cast alloy tips.

Millit, Inc, 55 Flint St, Rochester 8, NY



Separate Impact Hammer Head Mounts At Any Angle

Model Z-2, 12,000-lb impact hammer, has head available as separate unit. Weight of the head alone is 75 lb.

Hammer may be used for light stampings, forgings, trimmings, molding, crimping, coining, riveting, staking, or forming. Unit is operated at 100 psi and credited with 50 strokes per cu ft of air at a rate of 60 spm when operated by hand or foot control, 120 spm when actuated by solenoid valve. Recommended stroke is 3 in.

Air-Hydraulics, Inc, 248 Belden Rd, Jackson, Mich

EASIER TO INSTALL AND MAINTAIN!

mount 1 device instead of 2

extra-wide gutters

all components accessible from front

plenty of knockouts

SQUARE D COMBINATION STARTERS

(Switch or Circuit Breaker Types)

Save space and time. Mount and wire one device instead of two . . . neater, more attractive installations.

Write for Bulletins 8538 and 8539
Square D Company, 4041 N. Richards Street, Milwaukee 12, Wisconsin

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SQUARE D COMPANY

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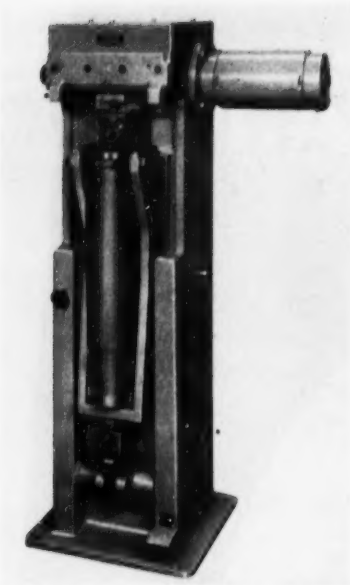


Cartridge Case Marking Machine Replaces Hydraulic Press

Machine will accommodate cartridge cases of brass or steel up to 105 mm shell size and obviate the use of hydraulic presses of as large as 50-ton capacity. U-shaped adapters which support cartridge cases under the rim are mounted on the work slide so as to be readily replaceable.

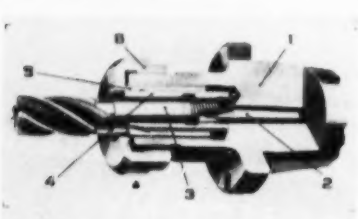
Air-powered work slide and die slide are controlled by single pedal or pushbutton. Sequencing is automatic and requires no adjustment.

Additional tooling requirements include a roll die holder with dovetail shank for mounting in machine die slide; holder accommodates the marking tools consisting of combination roll-making die and insert-holder assembly.

Air control unit, furnished with machine, consists of pressure regulator, gage, filter, and lubricator.

Machine is designated as Noblewest Model 353.

The Noble & Westbrook Mfg Co, East Hartford 8, Conn



British Self-Locking Chucks Eliminate Use of Adapters

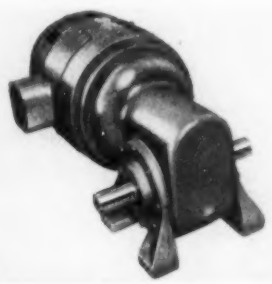
Autolock chuck eliminates the use of adapters through the range of its two capacities (1/16 to 3/4 in., and ⅞ to 1¾ in.). Dedlock chuck handles cutters from 2 to 6 in. Both are made by Clarkson Ltd of England and are accompanied by wide range of Clarkson cutters.

Autolock chuck consists of following parts as numbered in the illustration: (1) Arbor which is made with taper to fit any machine; (2) Male center which keeps cutter centered and insures rigidity while cutter is operating; (3) Cutter; (4) Collet—two dogs fit into neck of chuck body to prevent collet from turning; (5) Sleeve—houses the collet and has tapered portion which mates with that of collet; (6) Retaining nut—tightened by hand pressure on the threaded neck to retain sleeve in correct position.

It is said that Autolock-held cutters cannot possibly slip, pull down, or push up as the heavier the cut taken, the tighter the cutter in the collet. Because the cutter is held rigid and runs true, size slots and keyways can be cut in one pass with a size cutter.

Higher speeds and feeds are reportedly obtainable by use of Autolock because each cutter tooth takes an evenly distributed tooth load.

Imported by Clarkson, Inc, 320 Ontario St, Toledo, Ohio



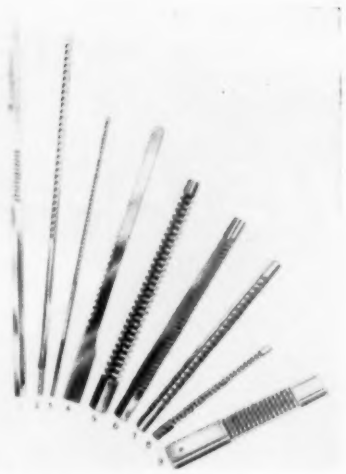
Right-Angle Motoreducer Has Three-Way Output

Reuland unit converts high-speed motor output to low-speed, high-torque output. Right-angle, worm-gear drive is said to cost less and provide greater versatility in mounting and load hook-up.

Unit permits simultaneous use of as many as three outputs: one high-speed directly from motor shaft, two low-speed from reducer. Drive motor can be either standard squirrel cage, slip ring, multi-speed, or fluid-shaft in drip-proof, splash-proof, or totally enclosed designs.

Motoreducers are available with ratings of ½, ¾, 1, and 1½ hp and speed reductions to 18, 24, 36, and 58 rpm respectively. Foot or ring mounting is optional.

Reuland Electric Co, Alhambra, Calif

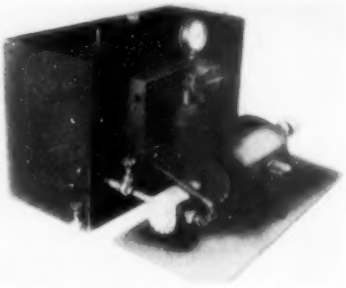


Special Broaches and Kits Offered by du Mont

Special-purpose broaches within the standard tooling facilities of du Mont are those having cutting sections of 20 in. or less, overall length of 36 in. or less, and square broaches not smaller than ¼ in. across flats.

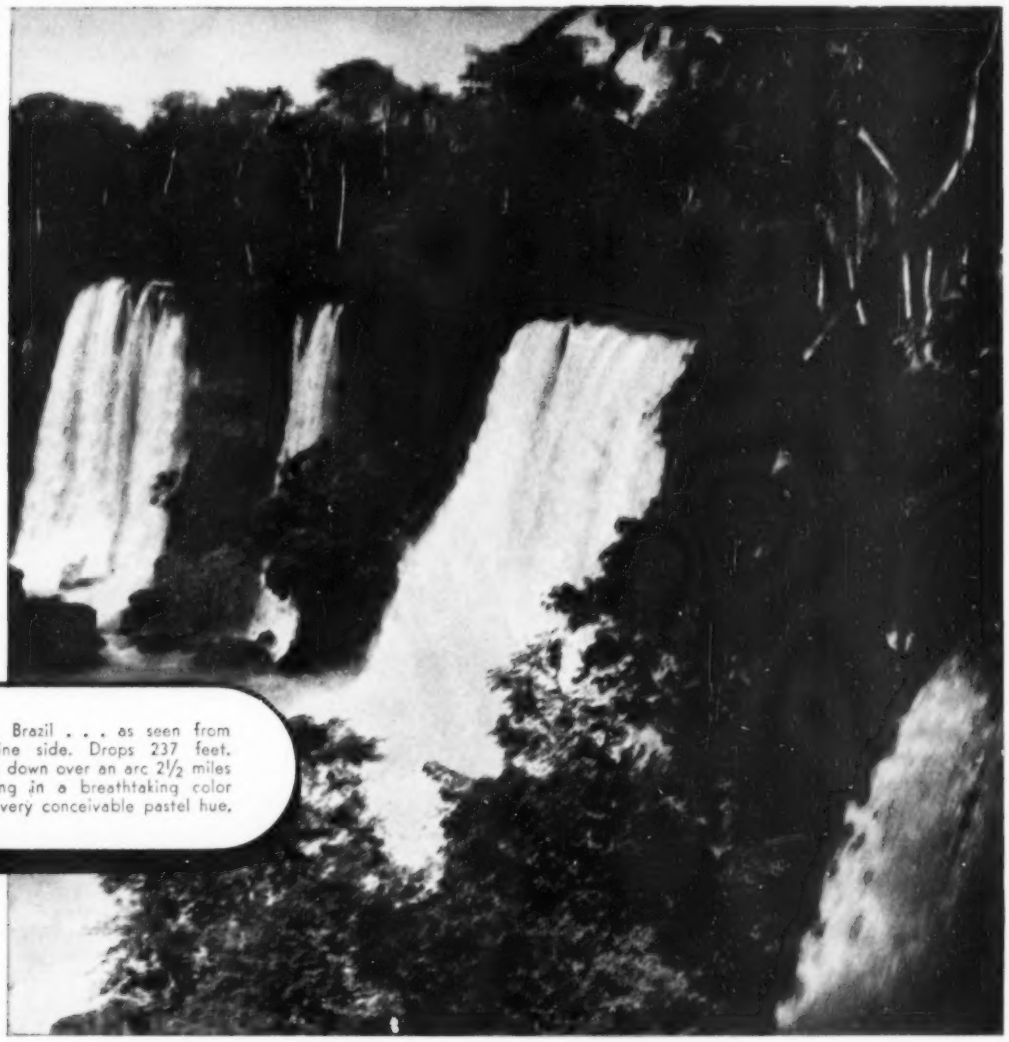
Illustrated broaches are: (1) Pull-type broach for sizing width and depth of slot in one operation; (2) & (3) Pull-type keyway broaches, single pass; (4) Keyway broach for use in Davis and similar type key-seating machines; (5) Push-type square broach with round pilot; (6) Push-type broach for squaring both ends of elongated hole in one operation; (7) Push-type production keyway broach; (8) Push-type square broach with round pilot; (9) Push-type broach for sizing four sides of rectangular hole in one operation.

The du Mont Corp, Greenfield, Mass



HYDRAU-POWER-PAK, with solenoid-controlled operating valve as optional equipment, is made with capacities from 5 to 50 gpm on lp side and ½ to 6 gpm on hp side; pressure to 10,000 psi. Relief and check valves, filters, and dial are standard equipment — *Clifton Hydraulic Press Co, 288 Allwood Rd, Clifton, NJ*

LOGAN FLUID POWER • DURABLE, DEPENDABLE SINCE 1916



Igussu Falls, Brazil . . . as seen from the Argentine side. Drops 237 feet. Water swirls down over an arc 2½ miles wide resulting in a breathtaking color display of every conceivable pastel hue.

LOGAN *AIR-DRAULIC® FEED-CONTROLLED* CYLINDERS

POWER MOVEMENTS IN ANY DIRECTION — NO POWER UNIT REQUIRED

COMBINES

the fast-acting, economical low pressure operation of

AIR

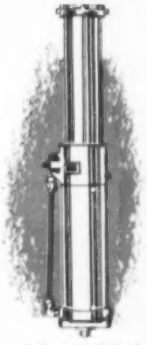
with the smooth, uniform controlled regulation of

OIL

5 ***STANDARD MOUNTING TYPES***

Standard bores from 3" to 8". Any stroke to 5 feet. For air pressures to 150 p.s.i.

Furnished for controlled feed with rapid return in either direction, or with controlled feed in both directions. Skip-feed movement can also be provided.



Air-Draulic Cylinder with Flange Mounting at Rod End

LOGAN MANUFACTURES 6,975 STANDARD CATALOGED ITEMS

FREE CATALOG ON REQUEST

AIR CONTROL VALVES, Cat. 100-4 • AIR CHUCKS, Cat. 70-1 • AIR CYLINDERS, Cat. 100-1 • AIR-DRAULIC CYLINDERS, Cat. 100-3
AIR and HYDRAULIC PRESSES, Cat. 51 • COLLET GRIP TUBE FITTINGS, Cat. 200-5 • HYDRAULIC CONTROL VALVES, Cat. 200-4
HYDRAULIC CYLINDERS, Cats. 200-2; 200-3 • HYDRAULIC POWER UNITS, Cat. 200-1 • SURE-FLOW COOLANT PUMPS, Cat. 62

SAVES TIME — Logan — AIR AND HYDRAULIC EQUIPMENT — EFFORT-MOTION

LOGANSPORT MACHINE CO., INC., 818 CENTER AVE., LOGANSPORT, IND.

Bay State Taps

...on nearby shelves of
industrial supply distributors.

BAY STATE TAP & DIE CO. • MANSFIELD, MASS.

Portable Turco Dy-Chek Kit for on-the-spot inspection for metal soundness includes a pint of dye penetrant, 2 pints of dye remover, 2 developer press-spray containers, a pint of developer, 3 brushes, a magnifying glass, a shaker of hand soap, and set of instructions.

Turco Products, Inc, 6135 S Central Ave, Los Angeles, Calif

Fitting, designed for liquid-tight flexible conduit, mates with any conduit spiral; does not have to be disassembled when installed. Particularly recommended for machine tool wiring or similar electrical circuits exposed to corrosive liquids and mineral oils, unit is available in 90° and 45° elbow designs to accommodate conduit from ⅜- to 2-in. trade size.

The Thomas & Betts Co, Elizabeth, NJ

Ton-dra treatment, a case hardening process supplied as standard on all X and Y Series Pivot punches, is said to have increased production 25% in field tests. Treatment, which produces an extremely hard, wear-resistant surface on piercing diameter of punches, does not involve any additional cost over standard catalog prices.

Pivot Punch & Die Corp, North Tonawanda, NY

Crescent heavy-duty dolly is now fitted with guards to protect casters when unit is fitted by fork truck. Swivel casters are fitted with plungers that can be engaged to lock them at a fixed position. Platform has magnesium, aluminum, or hardwood surface for rigidity.

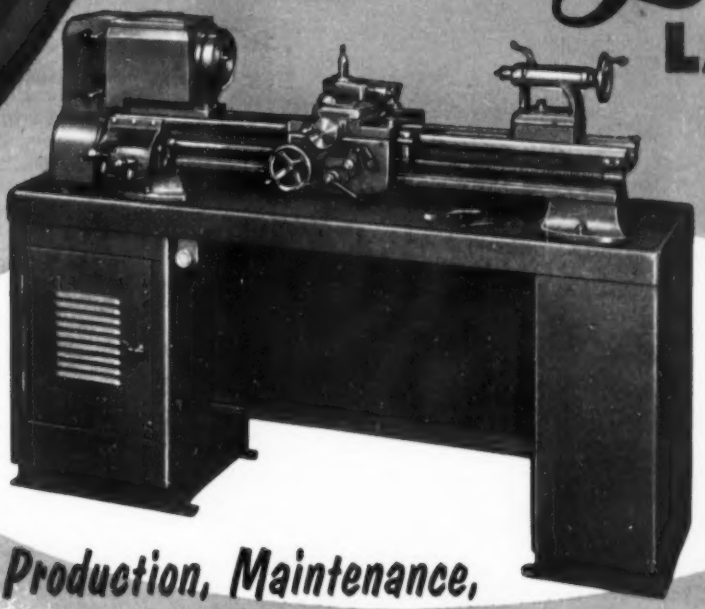
Crescent Metal Products, 1891 St Clair Ave, Cleveland, Ohio

Vinyl plastic-coated glass cloth fire blanket has been developed to protect workers and equipment endangered by flames. Stasafe blanket is impervious to weather, acids, alkalies, most solvents and chemicals. Surface can be kept clean by flushing with water or wiping with damp cloth. Weighs 2½ lb, is 76 x 60 in. in area, said to be 30% less expensive than wool fire blankets.

Standard Safety Equipment Co, Chicago, Ill

Line of hydraulic control hose to withstand pressures up to 5000 psi is reinforced with high-tensile steel wire to retain flexibility at temperatures from –40 to 250 F. Rubber tube

Presenting THE 12" SWING.. Logan LATHE



For Production, Maintenance, Tool Room or Shop Work

IT'S BIG...

With 12" swing over bed and saddle wings, 1" collet capacity, 1¾" spindle hole, and 35" center distances this newest Logan has the size to handle a major share of the average shop's lathe work.

IT'S RUGGED...

Its heavy headstock, massive spindle and rugged construction throughout make the 12" swing Logan a lathe of precision, stability and power.

IT'S VERSATILE...

Smoothly, without chatter, the 12" swing Logan Lathe hogs out amazingly heavy cuts. It is equally effective in high speed production and second operation work. Sustained accuracy at all spindle speeds (38 to 1260 rpm) is inherent in the ball bearing spindle mounting. This fact plus features like extra large compound and cross feed dials adapt it to exacting tool room operations. Its durable construction and enclosed design are important advantages in the school shop.

IT'S ACCURATE...

The wide-spaced, oversize ball bearing spindle mounting means *sustained* accuracy. Total spindle run-out, 12" out from the bearing is less than .0005". The 6 15/16" wide bed is heavily ribbed for rigidity. 2 V-ways and 2 flat ways precision ground to within .0005". Extra large dials on the new carriage permit accurate readings. Precision built throughout.

IT'S SIMPLE TO OPERATE...

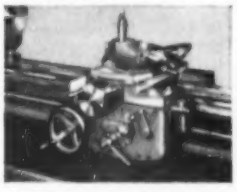
No spindle adjustment is required for any speed from 38 to 1260 rpm. Dials are easy to read. All controls and levers are easily accessible. Outboard drive simplifies belt adjustment and change. Inexperienced operators and students quickly master this rugged, accurate lathe.

IT'S ECONOMICAL...

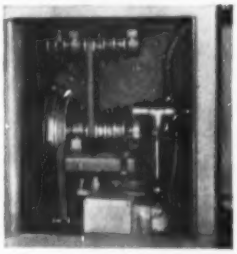
By the multiple economies it offers—investment, maintenance, space and power—the 12" Logan brings new economy and new profits to every type of lathe operation.

With FEATURES LIKE THESE

OUTBOARD V-BELT DRIVE
Double V-Belts transmit power to headstock with maximum efficiency and are easily accessible for change or adjustment.



NEWEST, FINEST CARRIAGE
Convenient, rigid, accurate, completely machined. Accurately machined and ground top surfaces on cross slide and saddle permit mounting fixtures and use of magnetic indicators. Apron operates in bath of oil. Simple, convenient, lever-operated disc type clutch.



UNDERNEATH V-BELT DRIVE
Jack-shaft and countershaft turn on ball bearing mounting. Motor and all parts are completely enclosed, yet easily accessible. Lever operated belt tension release.

SEE THIS NEW LATHE AT YOUR LOGAN LATHE DEALER'S, OR

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Full catalog descriptions and price information on request.

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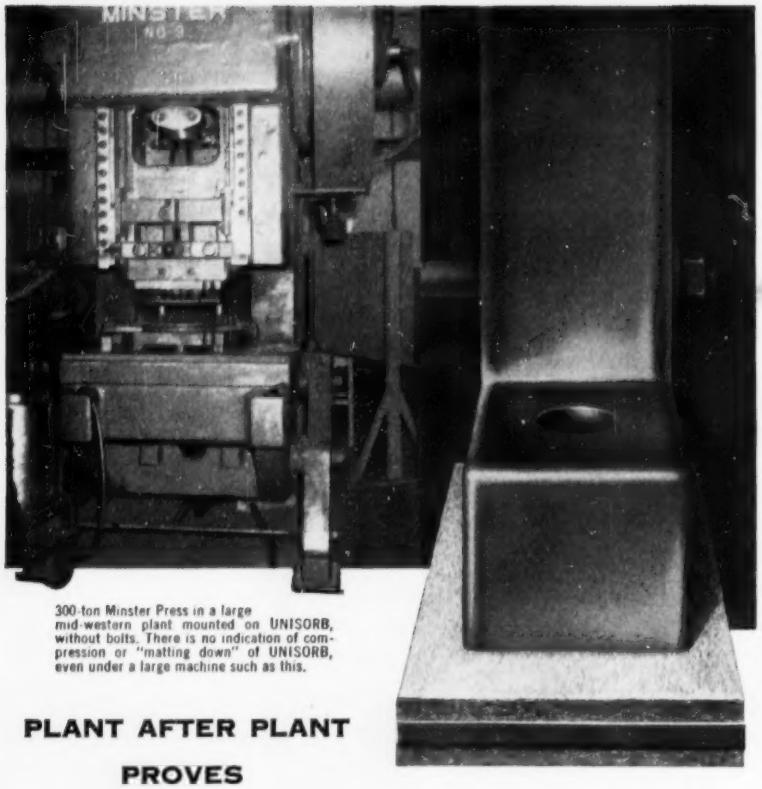
Chicago 30, Illinois

LOOK TO LOGAN FOR **BETTER** LATHES AND SHAPERS



300-ton Minster Press in a large mid-western plant mounted on UNISORB, without bolts. There is no indication of compression or "matting down" of UNISORB, even under a large machine such as this.

PLANT AFTER PLANT PROVES THAT MACHINES LARGE AND SMALL SHOULD BE MOUNTED ON

UNISORB®

In addition to reducing transmitted machine noise and vibration up to 85%, UNISORB saves you time and money on installation.

You don't need bolts or lag screws with modern UNISORB machine mounting. No more holes drilled in the floors. You simply order the grade of UNISORB recommended for each machine, cement the pad to the machine base and floor, let the cement set and begin operation.

Return the coupon today for your copy of the book that shows how easy it is to use UNISORB mounting pads. The book also shows how UNISORB reduces transmitted vibration and noise by as much as 85%.

UNISORB is also available pre-coated with adhesive, for use with machines which do not require shimming.

Look for the red center and UNISORB brand mark

The **FELTERS** Company
200 SOUTH STREET, BOSTON 11, MASS.

Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
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RETURN COUPON NOW! At no obligation to me, please send a copy of "Why It Pays to Anchor Machines with UNISORB."

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City ..... Zone ..... State .....
Return to: The Felters Co., 200 South St., Boston

is especially compounded to resist all common hydraulic fluids. High-pressure (2 or 3-wire reinforced) and medium high-pressure (1-wire reinforced) hose available in sizes from 3/16 to 2-in. ID.

Quaker Rubber Corp, Div, H K Porter Co, 1932 Oliver Bldg, Pittsburgh, Pa

Magnetic starter and contactor Series YG has been introduced in a 2½-in. size. Overlapping of rating permits use where a size 3 would formerly have been required. Controls, which include reversing types, are rated 20 hp at 208/220 v; 30 hp at 440/550 v ac polyphase; some are available with built-in pushbuttons or selector switch.

Furnas Electric Co, 1044 McKee St, Batavia, Ill

Button head socket screws are designed for smoother surfaces in applications where countersinking is impossible. Rounded tops and flush edges prevent exposed sides, eliminating hazard of catching on clothing. Sizes range from No. 8 x ¼ in. through ⅝ x 2 in. standard with NC threads. Sizes are standard with NF threads, except in ½- and ⅝-in. dias.

The Allen Manufacturing Co, Hartford, Conn

Hard maple edge grain tops are now available as individual units for workbenches. Furnished in standard widths of 24, 30, 36, and 42 in., and lengths of 3, 4½, 5, 6, 8, 9, and 10 ft. Obtainable in widths up to 48 in., and lengths up to 16 ft. Working surface is clear of bolts, nuts, holes, and sharp edges.

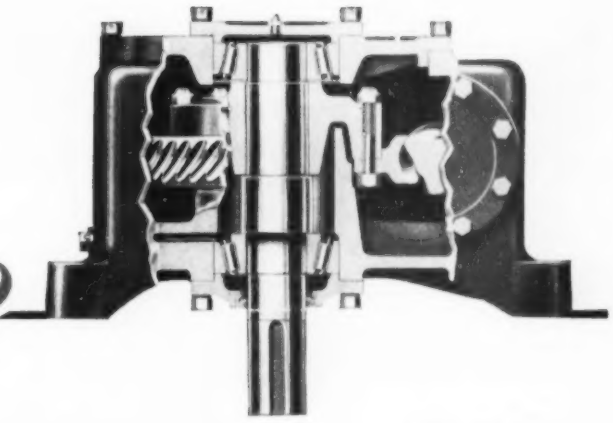
Industrial Bench & Equipment Manufacturing Co, 98 South St, New Britain, Conn

C-610 is a white paper masking tape which strips off without leaving residue or transfer after equipment has passed through a drying oven. Non-stain, non-toxic adhesion to Bakelite is 18 oz; tensile strength is 21 lb; thickness is 0.008. Available in roll lengths of 60 or 120 yd long, in any width from 12 up to 36 in. wide.

Armo Adhesive Tapes, 520 E 6th St, Michigan City, Ind

NEMA Size 4 vertical action starter has maximum polyphase ratings of 50 hp 220 v, 100 hp 440/550 v. Smaller than the clapper model it replaces, dimensions of the open type unit are 9-¼ in. wide, 14-¾ high 7-3/16 deep. Eight electrical interlocks, 4

THE RIGHT DRIVE



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. . . because they are designed and built to insure efficient and reliable power transmission even under the most severe operating conditions.

Philadelphia
WORM GEAR SPEED REDUCERS

are of extremely sturdy construction throughout. Bearings have a generous spread, which in the vertical units as shown here, provide for heavy radial loads. Note, too, the famous dry-well construction which eliminates oil leaks down the vertical shaft, and these are but a few of the outstanding features found in Philadelphia units.

Vertical type reducers can be furnished with output shafts extended either up or down. Conventional horizontal types can also be supplied. A complete range of ratios from 3½:1 up to 6300:1, in units up to 250 horsepower, provide complete selectivity.

For full information on Philadelphia Worm Gear Speed Reducers, write for catalog WG-51.

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Belts are only one of the many forms of coated abrasives available to you from Armour. There are more than 30,000 different varieties in grit size, backing, etc. We have sheets, discs, rolls, tubes—and specialty sizes to meet your specifications. Your industrial supply distributor will be glad to tell you about this complete Armour line. Call him today!

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normally open and 4 normally closed, may be added either pre or post shipment. These are mounted on their own insulating base and can be fastened with two screws without removing starter from enclosure.

Square D Co, 4041 N Richards St, Milwaukee, Wis

Autoset self-setting clamps are designed for any work requiring a solid gripping capacity. Has no pins, threads, or movable parts necessitating replacement. Priced at $2 to $7.25, clamp is available in any quantity, types D-1 to D-6 ranging in size from 3-½ to 8 in. overall length.

Alpha Tool & Supply Co, Closter, NJ

Vantrol 5510B, a tool lubricant particularly developed for heavy metal tapping operations, has polarity characteristics which resist wiping action and give better carry-through. Said to have extreme pressure qualities; designed for brush-on application and easy removal after cutting oil emulsions. Single application is reported to restore unfit tapping.

Van Straaten Chemical Co, 546 W

Device for joining ends of round leather belting has been introduced by which ends can be tapered and cemented together in less than two minutes. Cement will set sufficiently for use in two hours or less. Said to be particularly useful on machines which cannot be taken apart to insert a standard endless belt.

Louis Levin & Son, 728 E Pico Blvd, Los Angeles, Calif

Non-fading, corrosion-resistant organic finish is now being applied to aluminum, brass, steel, and zinc coils in widths from ⅛ to 30 in., 0.010 to 0.036-in. gage, in continuous lengths. Baked enamel finish is said to stand up well under forming, drawing, bending, or fabricating. Reported not to crack, chip, or chalk under abnormal use or severe weather conditions.

Apollo Metal Works, 66th Place and South Oak Park Ave, Chicago, Ill

Revolc water suction hose is especially designed for both pressure and suction handling of water. Lightweight hose, reinforced with two layers of braided rayon cord, plus helix of high-tensile spring wire, will not kink or collapse, maintains full opening in any position. Available in 1-¼-in. to 3-in. ID sizes.

Quaker Rubber Corp, Div, H K Porter Co, Philadelphia, Pa

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MODEL UN-450

Heavy Duty Lathe

SCHAERER MODEL UN-450 HEAVY DUTY COPYING LATHES.

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permits rough turning and finish turning in the same operation in many instances. Swings 17-3/4" over bed, 9" over carriage,, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M. Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

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Copies simultaneously in 2 directions; 49 longitudinal and cross feeds; All gears in headstock hardened and ground; Automatic carriage release when overloaded; Separate oiling systems for front and rear end bearings; Ball stop catch on cross slide guarantees accurate depth adjustment for thread cutting; Adjustable carriage stop for longitudinal turning.

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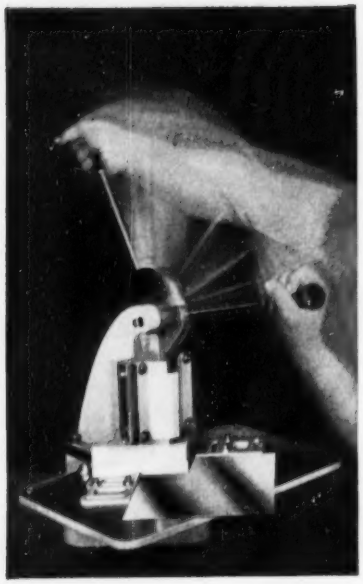

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Speed up notching operations, eliminate the need for heavy presses and dies with a Di-Acro Notcher. A 6"x6" notch can be made in 16 gauge material in one operation. Many straight shearing jobs also performed.

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REPRINTS, CLIPSHEETS

Readers frequently want copies of material in past issues, something we're always glad to provide if we can. There are quantity requests—once over a quarter-million in one batch—single requests, and "several-copy" requests, so it may be helpful to explain the whole business.

In the first place, a small number of copies of each issue is ordered for stock, plus about 15 sets of tearsheets or clipsheets of all editorial material in the issue. The clipsheets are available free as long as the supply lasts; the extra copies of the complete issue are available at 50 cents a copy, except for special issues. If you're interested only in one or two copies of a particular article or page, just drop us a line — they'll come to you promptly. Don't order the complete issue unless that's what you want. Issues usually are not available after six months, clipsheets after a year.

The exception to all this is our regular-issue Special Report, which we always reprint in some quantity and stock for a reasonable period. These can be had at 15 cents for an 8-page one, 20 cents for a 12-page, 25 cents for a 16-page, with reductions for quantities over 100—again as long as our supply lasts. Just send coin or your check with your request.

QUANTITIES OF REPRINTS

Readers and advertisers can also order quantities of certain articles. In this case, a variety of factors enters. First of all, there are two methods of reprinting, letterpress (like the magazine itself, but on heavier stock), and offset. The smallest letterpress quantity is 250 and the smallest offset quantity 100. Offset is far cheaper for limited quantities—say up to several thousand—but is a photographic reproduction of the pages of the magazine itself, hence loses somewhat in quality, particularly in halftones (the reproduction of photographs). Thus, if you want clear reproduction of detailed halftones, offset is doubtful. Letterpress, on the other hand, is printed from the original type, and frequently is better than the magazine itself, but must be ordered within a couple of weeks of the date of issue or our printer will have destroyed the type. (If you suspect you'll want letterpress reprints of a particular article, ask us *at once* to hold the type until you decide—we can hold limited amounts six months.) Letterpress is slower, and twice as expensive, or more in small quantities. For articles that are all type, or type and line drawings, we recommend offset.

There are, of course, dozens of variations to these basic elements. We can rearrange articles to suit a particular folder idea, add title pages or other pages, additional data, etc, but we will *not* change the sense or import of the article. We can, and will, correct misspellings or errors of fact, if they occur. We also can, under certain conditions, produce reprints bound in the cover of the particular issue, without advertising normally occurring on pages 2, 3 and 4. It is preferable, however, in this case to order the covers printed as part of our regular press run to save money.

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We will also grant permission for you to make your own reprints of our articles in most cases—assuming your purpose is legitimate and the author has not retained republication rights. You must, however, write us to request permission, giving us an idea of quantity and purpose and guaranteeing to carry prominently displayed that the article is reprinted from *American Machinist*, with the date and the copyright notice. Otherwise, you are guilty of violation of copyright, which is a serious offense and one on which action by us is mandatory if we are to preserve our copyright on the entire original issue.

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replacement parts

Lifting 100,000 pound dead weight loads--with shock-free, pin-point control--is everyday work for this big, rugged, diesel-powered locomotive crane. It's one of the famous Orton cranes --with Torque-Control. It was made for General American Transportation Co., East Chicago, Ind., by Orton Crane and Shovel Company, Chicago. And, A. M. Castle & Co. furnished the alloy steels used in its construction.

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Like Orton, many other Castle customers make similar large size units on an individual basis. Many more manufacture small parts on a volume production basis. Together these customers require practically every standard grade of alloy steel--and Castle supplies it. So, if you need alloy steels--any grade, any shape, any quantity--A. M. Castle & Co. can deliver exactly what you want, when you want it.

In addition, you'll like the fast, friendly, intelligent service that is a tradition with this 61 year old organization--one of the largest independent steel distributors in the United States. With nine large, heavily stocked, fully equipped warehouses from coast to coast--Castle can supply you with EVERYTHING in steel. So, for whatever you need--phone A. M. Castle & Co. today. You'll be glad you did.

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THE CHARLES L. JARVIS CO., MIDDLETOWN IN CONNECTICUT

ROUND TABLE Discussion

BACKFIRIN' DISCIPLINE

What is the best way of impressing workers with serious consequences of an important mistake? Is discharging such a worker always the answer, or suspension for a limited period? Sometimes other factors should be taken into conisderation...

When a man puts in ten to fifteen years of good service then makes a "boo-boo," his disgust with himself is tougher to outlive than any punishment his supervisor can concoct for him. If the foreman blew his top and called him a knave, the employee would have a good reason to stop off on the way home for a couple of snorters.

He would walk into the house and slam the door behind him. His wife would keep out of his way all evening while he growled and grumbled about the house. In the morning he would report to work with his tail between his legs and the other employees would give him plenty of sympathy. In a few days everything would be back to normal and the employee would be a wiser man. He might put in another twenty years without any serious damage and tell his children about the time he smashed up a die because he was being pushed for production.

In the old days the machinist was a perishable tool. If he lost his edge or became obsolete, he was discarded. Formen would fire a man at the drop of a hat to show their authority or to set an example. Today a man is a capital investment. As long as his assets exceed his liabilities in the proper ratio, he is a profit to the organization.

If every executive submitted his resignation when he made a mistake or if the owner shut down his plant because of a faux pas, we would be a stagnant nation. I can imagine what an impression I would make if I divorced my wife because she smashed up the fender of the car.

It has been my experience to voluntarily take a few days off after a blunder because of the humiliation I suffered. I don't think that the company ever lost an account because of an error I made and maybe that is why I was welcomed back.

Frank J Zarnowski
Rutherford, NJ

POWERFUL
FLEXIBLE SHAFT MACHINES

AN INDUSTRIAL MACHINE FOR INDUSTRIAL USERS

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Do Your Jobs

EASIER -- FASTER -- MORE ECONOMICALLY!

Whether your operations call for GRINDING, CUTTING, BUFFING, SANDING or ROTARY FILING, Jarvis Flexible Shaft Machines are available in BENCH, FLOOR or OVERHEAD Types — in Single or Multiple Speeds to suit your Individual Requirements.

A Jarvis Factory Trained Representative will be pleased to assist you in selecting models best suited to your use. Complete catalog upon request.

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REVOLUTIONARY DISCOVERY...

The world-wide demand for our latest abrasive development, GRITCLOTH, has already forced us to increase our production capacity. Right now we are keeping abreast of the still growing clamor for this most advanced sanding material.

GRITCLOTH gives the removed particles a place to go and thereby maintains fast cutting action throughout its amazingly long life.

For machine and hand sanding or polishing . . . wet or dry . . . it's GRITCLOTH. Order now!

TOMORROW'S SANDING FABRIC TODAY!

Innumerable Uses for Metal and Paint Finishing.

Excellent for fast, smooth rubbing of prime coats on all boat and marine finishes. Extra-long life whether you use GRITCLOTH wet or dry.

Outstanding results from leading car manufacturers using GRITCLOTH for wet prime-coat sanding. BOTH SIDES OF GRITCLOTH are used, for maximum life.

New production speeds in all metal fabrication finishing and deburring. Less down-time means more production and less cost with GRITCLOTH.

Non-loading feature gives GRITCLOTH tremendous advantages in speed and amount of material removed. GRITCLOTH saves you money on machine or hand polishing.

CLOTH

OPEN MESH SANDING FABRIC

PATENT APPLIED FOR

..."HEARD 'ROUND THE WORLD"!

★ 10 to 15 TIMES LONGER LIFE than the conventional types of coated abrasives.

★ NON-LOADING . . . OPEN MESH LETS THE REMOVED PARTICLES FLOW RIGHT THROUGH.

★ THOUSANDS OF SUPER-SHARP EDGES KEEP ON CUTTING.

★ USE WET OR DRY

★ FLAT OR FOLDED

★ BY MACHINE OR HAND

★ BOTH SIDES

★ APPLICATIONS ARE LIMITLESS . . . each day finds a new successful operation for this Miracle Modern Sanding Fabric.

Where can YOU use it?

GRITCLOTH

...A BAY STATE PIONEERED PRODUCT

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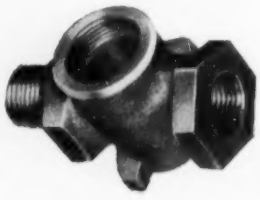
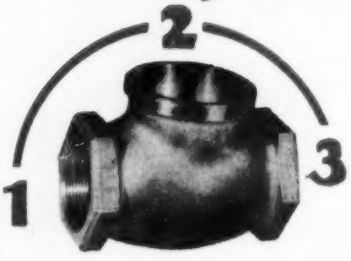
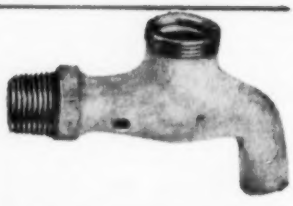
Single set-up covering
ALL finishing operations...

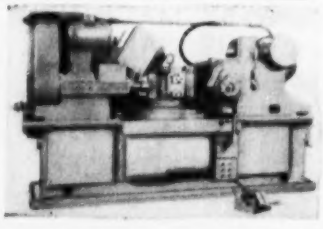
MEANS GREATER ACCURACY *with* **GOSS DeLEEUW**







AUTOMATIC CHUCKING MACHINES



One of the many important advantages being realized with this new chucker is the performing of ALL finishing operations on a single chucking of the work. In addition to the time saved, this feature, exclusive with Goss & DeLeeuw "1-2-3" machines, means only one handling of the work with an attendant greater accuracy. This machine is in a class by itself in precision finishing.

In Goss & DeLeeuw "1-2-3" Automatic Chucking Machines, one, two, or three ends of the work are machined simultaneously or in sequence. There is no need for resetting, retooling or secondary operations. More work from one machine and greater accuracy are matters of record.

Ask for illustrated literature describing the operation of this chucker in detail. Send samples of your work for time and cost estimates.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

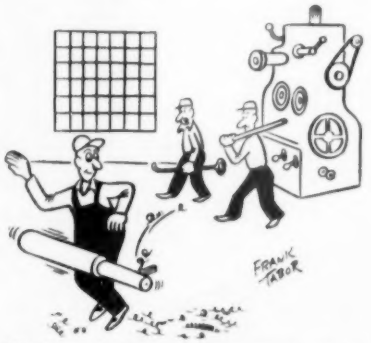
GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY

The problem of making the punishment fit the crime is one that has baffled the experts for many a year, without any of them coming up with the right answer. To expect a solution to this age-old poser from the average foreman is something on the order of expecting him to explain the theory of relativity.

If he fires old man Watkins he loses a man with fifteen years know-how who will be difficult to replace. On the other hand, if he gives the offender a week off to meditate on his sins, the company loses a week's production while Watkins is liable to think things over and decide in his own mind that the die was at fault—as it very well could have been—and use his enforced vacation in looking around for another job. In which case Al's discipline is going to backfire for sure, if Watkins finds the pastures more inviting somewhere else. In these days of diminished labor supply you don't find an experienced man looking around for long, the law of supply and demand being what it is.

Which would seem to leave Al with his disciplinary problem still unsolved. In my opinion, there is no need for such drastic measures as firing or laying off a man with an admittedly fine record even for a costly mistake. If the man was at fault, and there seems to be some doubt about it, he is going to feel badly enough even without the severe reprimand which his mistake calls for. It has been my experience that if you show the average man in dollars and cents what a mistake costs he will do his utmost to make up for it in the future.

But before even reprimanding an employee I think the wise thing to do is to find out how the mistake happened, in other words pinpoint the responsibility. If you know all the facts involved you are in a better position to judge the degree of an operator's responsibility than



"Hank finally built himself a clear plastic lathe."

here's a test you can make

with a quarter

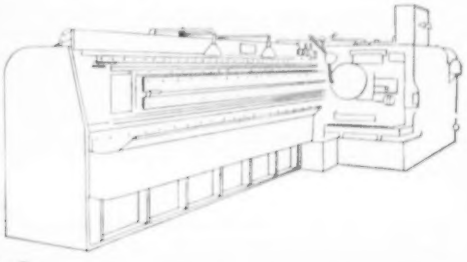
- Stand a quarter on edge directly over the spot where the BROACHING is taking place;
- remove all the required metal on a TURBINE DISC;
- go through the automatic cycling — repeatedly;
- *your quarter will still be standing!*

on this new **LAPOINTE** **ELECTRO-MECHANICAL DRIVE**

horizontal

BROACHING MACHINE

We eliminated vibration by the very weight and massiveness of this machine! Constant chatter or vibration at the cutting edge of any tool will materially shorten the life of the tool. *Eliminate vibration and you multiply the life . . . six times . . . eight . . . or even ten times!*

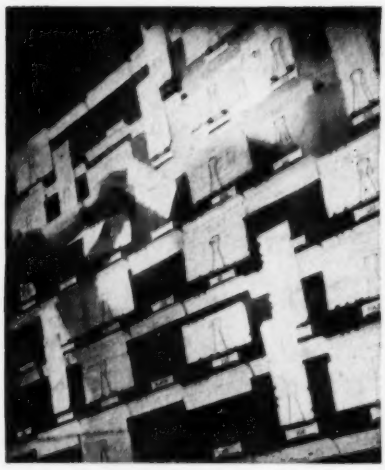


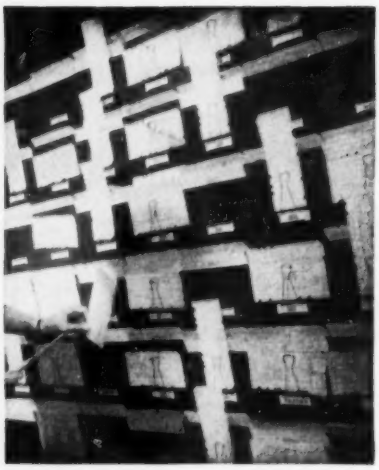
Strokes of 100" to 180", and broaching speeds up to 300 fpm — and more — are available on this amazing new LAPOINTE machine. Complete details are given in our Technical Bulletin, sent promptly on request.

Ask for Bulletin S·R·H·E —2

LAPOINTE

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES





One movement of Job Time Ticket on these McCaskey Boards directs dispatcher, move-men, set-up men and operators according to production plan . . . with

NO ASSEMBLY DELAYS FROM MISSING PARTS NO EXCESS WORK IN PROCESS

Barcalo Manufacturing Company, Buffalo, N.Y. has met the problems of dispatching production of a widely diversified line of products . . . from hand tools and metal furniture to pillows and mattresses . . . with McCaskey Machine Loading, Scheduling and Job Assignment.

Shop orders formerly were handled in a "blind file" and one or more parts often were overlooked or delayed with serious results. This is totally eliminated by the use of McCaskey Machine Control Boards and the following procedure developed by W. J. Navelle, Production Control Manager:

1. **Job time tickets are pre-written without operators' clock numbers (see paragraph 7) and assigned to machines by Production Control Department.**
2. **They are placed by dispatcher in rear pockets of McCaskey Machine Control units in sequence specified by Production Control. Load is recorded on load cards.**
3. **Foreman selects jobs to be run next and moves tickets to front pockets of control units.**
4. **Dispatcher issues stores requisition for material, attaches to and notes action on job ticket.**
5. **Material move-man takes requisition to stores, delivers material to or near machine and marks ticket when move is complete.**
6. **Set-up man checks board, draws tools and dies and marks ticket when job is ready to run.**
7. **Job is assigned to operator by dispatcher; his number is written and starting time is stamped on ticket. Ticket then is visibly filed under clip spring at front of control unit.**
8. **When job is finished, dispatcher rings out ticket, enters production summary on permanent record and sends ticket to Production Control.**
9. **Production Control completes its record and sends ticket to Payroll Department.**

Foreman, by quickly referring to McCaskey Board, selecting jobs to be run and moving job tickets thus provides instructions for (1) dispatcher, (2) move-men, (3) set-up men and (4) operators. Jobs are run and essential operations performed according to Production Control's plan. This McCaskey installation once again demonstrates how readily duplicated effort, delays and confusion are replaced by economical, planned production.

Let us talk with you about a McCaskey procedure for your department or plant. Equally adaptable to line or job shop production, assembly, maintenance or individual job assignment. Mail coupon today for complete information.

McCASKEY REGISTER CO.
ALLIANCE, OHIO

Please send me bulletins describing McCaskey Machine Loading, Scheduling, Dispatching and Job Assignment.

Name .....

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McCaskey

INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY
TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

if you go off half-cocked without knowing the score. It is just as bad for the morale of a department to have a foreman blow up and fire a man on the spot as it is to err on the side of leniency.

Admittedly, too many costly mistakes will ruin any company, but the average organization during its lifetime must be prepared to accept the risk and absorb the losses involved, whether the human element was at fault or the physical properties of a costly die failed under fair wear and tear. Under ordinary circumstances a competent foreman can and does do much to minimize the chance of these mistakes occurring by weeding out the habitually careless. A workman with a fine record, however, deserves to have the scale of justice tipped a little in his favor. It pays to remember what his years of faithful and productive service have meant to the company.

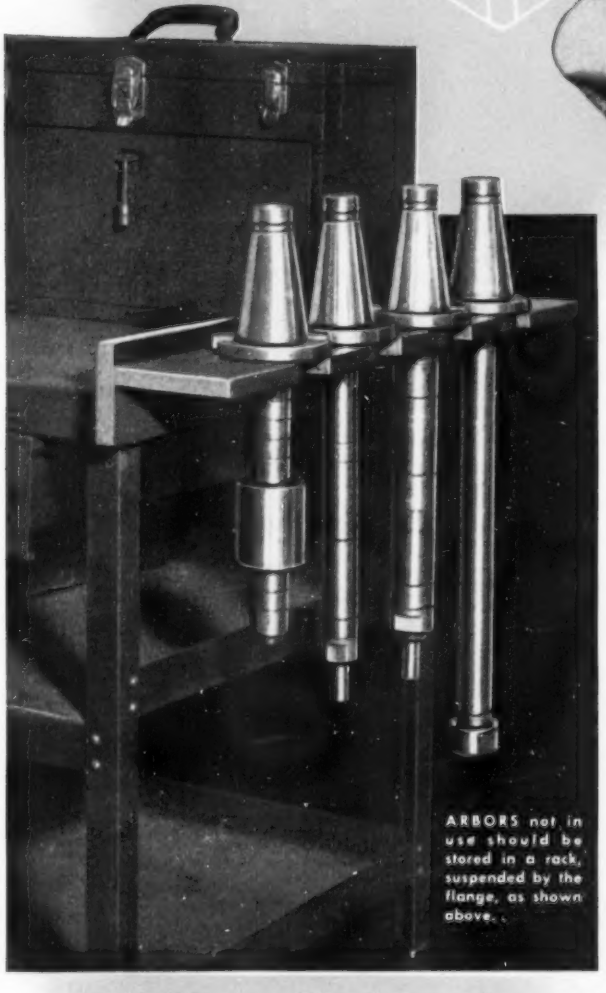
Robert S Alexander
Greenville, RI

When a company or an individual takes on the responsibility of operating on a businesslike basis, they must also take on the problems which come along. One can not divorce all risk from a venture . . . it must be assumed that in order to profit one must at least be willing to gamble.

Working with human personalities and having them do work for you presents a problem that faces all companies. No one believes for a minute that everyone is perfect or that mental lapses do not occur. If you are so foolish—just take time to stop to think and analyze your own actions over the past years. Haven't you sometimes done things which had no apparent rhyme nor reason? You would be very superior if you hadn't.

"Better recheck this, Bell — looks to me as though it's still about five thousandths off."

That's Right, My Lad —PLAY SAFE!



ARBORS not in use should be stored in a rack, suspended by the flange, as shown above.

This young catcher has the right idea. He wears a mask behind the bat. He doesn't believe in taking any unnecessary chances.

Many a shop foreman . . . or superintendent, for that matter . . . could learn a lesson from this cautious youngster. For often a shop executive has to "take-it-on-the-chin" when vital production schedules are disrupted.

For example, when a milling machine arbor breaks down, production ceases instantly. Both machine and operator become idle, and their supervisor is in a dilemma . . . UNLESS a spare arbor is immediately available.

So play safe! Keep several spare arbors on hand for emergencies. Remember, arbors are classed as "perishable tools" and their cost today is relatively small.

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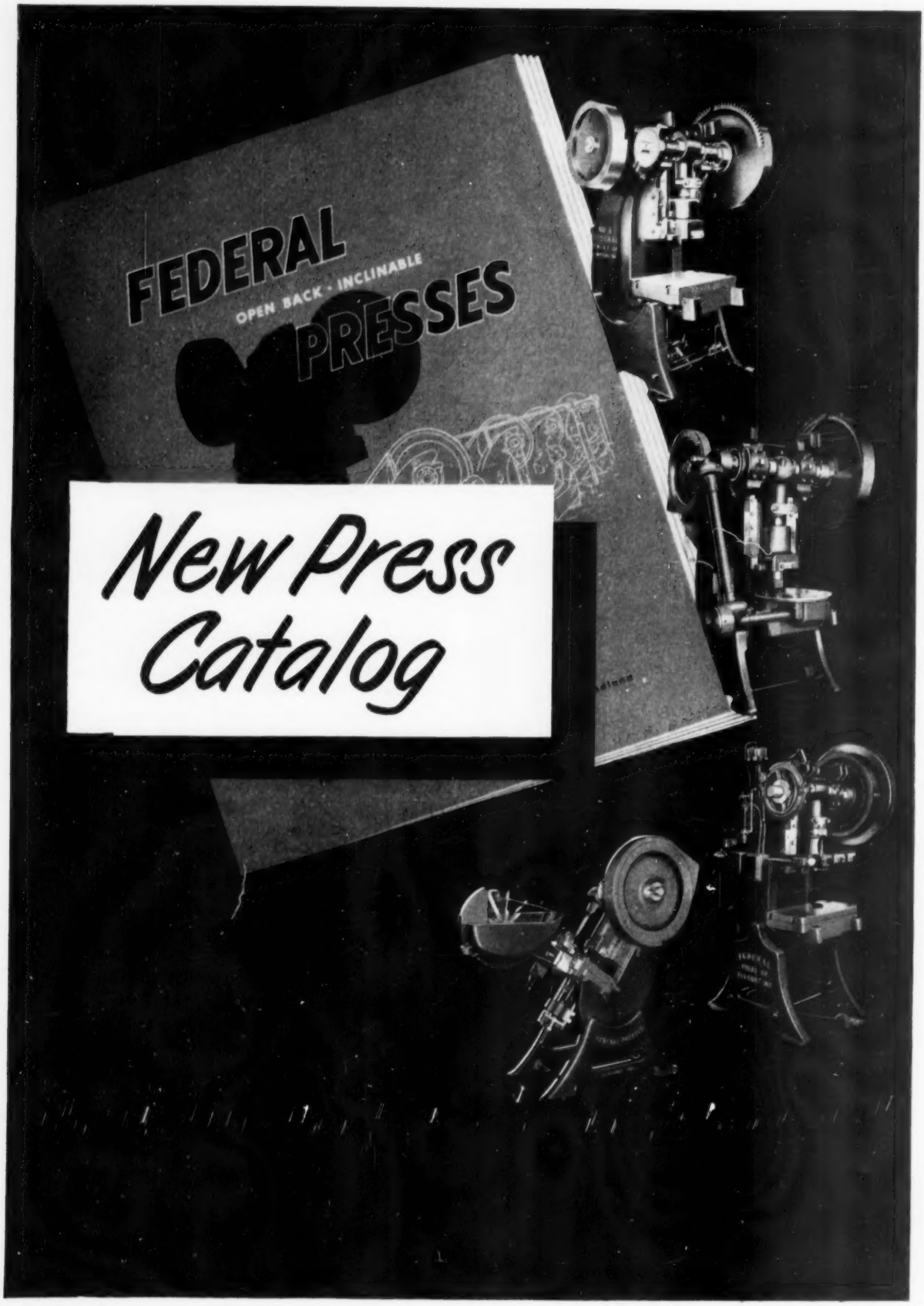
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People know how to do a job, they know safety, they know proper procedures and yet they fail sometimes to follow the proper pattern. Why? Perhaps because we are only human and not automatons. Maybe it is that subconscious problem which creates a mental lapse. Perhaps it is because we are trying too hard to accomplish something that is just beyond our abilities. Maybe it is the boss himself who forces the situation to a critical point.

What should be done about situations which arise, where such failures cause loss of time, material or even human anatomy? It is costly, not only to the company but often to the individual. It is certain that a person who mentally fails to follow the narrow path and causes disaster himself suffers many tortures. He feels his worth as an individual has been destroyed. Many times it means he has lost his position in a company. Only because of labor laws do companies hold on to employees who get hurt due to mental lapses on the job. Sometimes these people can be helped, if proper attention is paid to them. Usually they have problems which companies should be trying to solve through proper human or public relations. We are living in a stepped-up age and people who enter into the business world are forced to face many problems our forefathers never even could dream would exist. We, therefore, must set up proper schooling or training to help our workers. The only way to prevent errors is to have a fully relaxed mind concentrated on only the work at hand. Even then, if one is being driven, mis-steps can cause disaster.

It is not right to blame a worker for an accident providing he did not cause it intentionally. There are some people who are working against the world, but fortunately they are

"The boss will be coming through here soon —okay if I take some of your shavings?"

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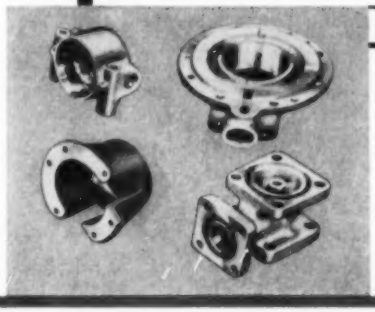

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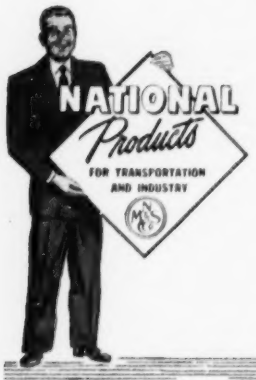

Products bearing these familiar trademarks have all established enviable reputations for quality and dependability. And to guard product reputations, these manufacturers *continue* to specify castings by National —one of the Nation's largest founders.

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the minority group. However, they are present in the business world and must be screened out.

If, in our case, Watkins has always been a good worker and, because he was being pushed he mentally failed, then it is as much Al's fault as it is the fault of Watkins. Al, being the foreman, should have had an over-all picture of conditions. He should have known whether Watkins could work under pressure without error. Some people just can't do that. To fire a man because he made one mistake, even though costly, is like operating in controlled territory where if you do not adhere to the thinking of the "party," you reach the firing line.

If Al did his job properly, and still Watkins failed, and Al truly feels that the error was entirely Watkins' fault, then Al must decide whether any discipline should be handed out. No general rule can be established. If we take the attitude that we must fire the man because he fails, then your boss should fire you for not properly running your job and letting the error occur. This thinking could be carried right up the line until it becomes nothing more or less than buck-passing and does not serve in any way to correct the measure.

As to the definite idea of a diebreak and the non-shipment of parts, always remember that other companies are faced with operating with humans also. Never try to cover up. And above all, don't wait until the last minute to process an order. Sometimes it is improper management that causes human failures at the lower levels. Remember that. Don't always be trying to get out of analyzing your problems by saying "It was Joe's fault."

Charles D Townsend
West Hartford, Conn

"No sense buying complete overalls, all I do is push buttons."

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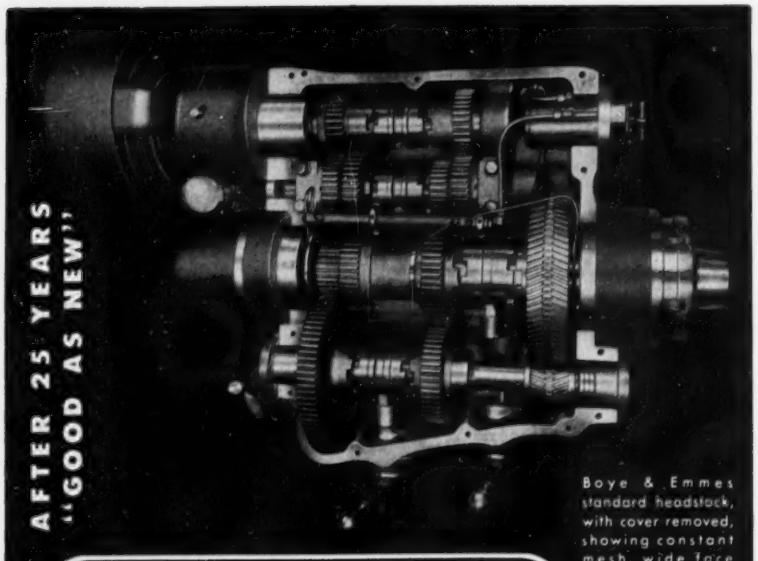

Boye & Emmes standard headstock, with cover removed, showing constant mesh, wide face gears and large diameter, positive jaw sliding clutches.

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-After 25 Years-

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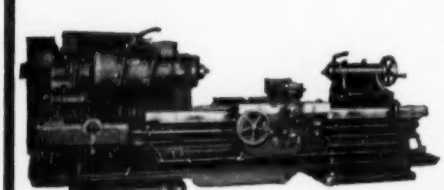
If you are not now using Boye & Emmes Long Life Engine Lathes, investigate. Compare this lathe of low maintenance and high accuracy from every viewpoint. Specifications and details of construction for all sizes are contained in our free Bulletin No. 601. Write for it today!



*One of many documented cases of "no wear" in Boye & Emmes constant mesh lathe headstock, after years of use.

LONG LIFE LATHES

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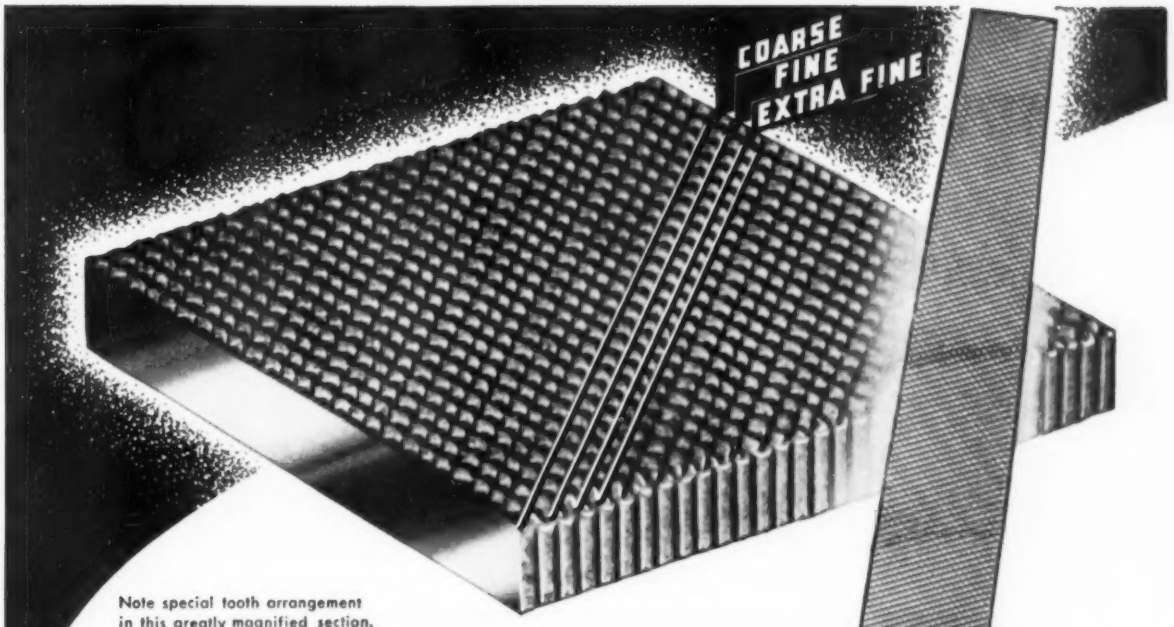
"Carelessness does more harm than a want of knowledge." Faulty workmanship due to carelessness is ample cause for disciplinary action in most plants. This violation of shop rules is punishable from a warning to discharge, depending on the seriousness of the offense. Every employee has a duty to know the shop rules, particularly the one dealing with faulty workmanship. The purpose of shop rules is not to restrict the rights of anyone, but to define them and to protect the rights of all. Carelessness resulting in spoiled work is a profit-stealer for the company and in turn adversely affects the men employed by it.

Defective work is a very important consideration to every employer. Work must be right. A few spoiled jobs and the small shop is through. The larger shop while not so drastically affected is nevertheless placed in a precarious position. The only deterrent to careless work is continuous and adequate supervision by the foreman. Workers are less liable to make mistakes when their supervisor is in constant contact with them and actually supervises their work in the shop, and not from his office desk.

"Nothing improves a person's driving like a police car right in back of him." Nothing improves the average worker's operation so much as that his foreman is constantly on hand to see that everything is going smoothly. Workers have a habit of getting slack and fail to keep on their toes where the supervision is slack. It is therefore my opinion that carelessness which results in spoiled work is as much the responsibility of the foreman as the worker. However, carelessness resulting in faulty workmanship can be contagious and should be dealt with as a matter of shop discipline to bring the seriousness of this type of offense to the

"These coffee-breaks are getting to be a real problem."



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THE OK TOOL COMPANY, Inc., Milford, New Hampshire

One Sure Way to Get MORE DEFENSE FOR LESS MONEY

How can we get more national defense for less money? The best answer yet given to this question appears in a little-noticed section of the new defense budget. That answer, with which this editorial is concerned, is to provide more equipment with which to step up munitions production in an emergency. Thus we can eliminate much of the need to stockpile finished munitions in advance.

The new defense budget provides an appropriation of $500 million, to be invested by the Secretary of Defense in specialized facilities required to produce munitions on a wartime scale, but not adapted to profitable operation by private industry in normal times. Facilities of this type are known as "stand-by capacity."

There is no strictly political controversy over the "stand-by capacity" program. It was originally suggested by Clay Bedford, Special Assistant to the Secretary of Defense during the Truman administration. It has since been reviewed and endorsed by the Eisenhower administration. Moreover, it involves little or no technical controversy. Civilian and military experts are well agreed that the only alternative to enormous expenditures for stockpiling military equipment is to provide enough facilities for producing it quickly in an emergency.

Here is the Key Idea

In his speech of May 19, introducing his defense budget to Congress and the nation, President Eisenhower stressed the value of such reserve capacity in these terms, ***"The more swiftly and smoothly we can mobilize, the less our dependence upon costly standing armies and navies."***

In accord with this idea, the $500 million requested for the present reserve capacity program would be invested in tools that require a long time to produce, and so present grave complications in an emergency unless they are ready in advance. Some such tools would be installed in new plants that are needed to eliminate potential bottlenecks in the defense production program. Others would be ordered to replace that part of the government's present machine-tool inventory which is made obsolete by changes in the design of defense products. By completely "tooling up" with the most modern equipment, the admin-

istration hopes to realize a production potential many times greater than could be achieved by spending the same amount of money on military end-products.

Examples of Savings

In the specialized field of defense production, adequate modern capacity is the key to both economy and speedy delivery in a pinch. Here are some striking examples from the recent report of the Advisory Committee on Production Equipment (Vance Committee) to the Director of Defense Mobilization:*

—In the case of certain ammunition components, the cost of new capacity can be recovered in only six weeks of full production.

—If $500 million worth of special tools needed to make aircraft are purchased in advance, aircraft production during the first two years of war will be increased about $18 billion. In other words, it costs 1/36 as much to acquire the tools in advance as to acquire the aircraft.

—In the case of a certain ordnance item, an expenditure equal to the cost of only 150 units of the item will provide the capacity to produce thousands and save three years' time in meeting mobilization requirements.

Moreover, reserve plants and equipment can be kept up-to-date at only a small fraction of the cost required to maintain an up-to-date reserve of military end-products. The cost of replacing 5,000 obsolete tanks is at least $1 billion. The cost of new tools for a tank plant would be less than 10% of that amount.

*This Committee, headed by Mr. Harold Vance, President of the Studebaker Corporation, included Clay Bedford, then President of Chase Aircraft, Manly Fleischman, former Defense Production Administrator, and several retired military leaders with wide experience in procurement.

Savings Will Multiply

On the basis of facts like these, the Vance Committee recommended that the Defense Department spend $500 million to $800 million per year on specialized defense production facilities in order to provide substantial reserve capacity as soon as possible. It also recommended that expenditures for military end-products which get obsolete rapidly be held to a minimum. The Eisenhower administration has adopted this approach to the problem of munitions production in asking that $500 million be invested in reserve capacity.

The importance of this approach is much greater than is indicated by the amount of money to be spent on new tools, although this amount will go far toward assuring a healthy machine tool industry, adequate to meet emergency demands. ***What is really important is the great saving that can eventually be made in the cost of our defense program by a modern tooling program.*** If we are to maintain this program for a long period, and if we are to pay as we go, we must have a low-cost program. No other plan to reduce and control the cost of a garrison economy can compare with the new approach suggested in the Vance Report and now embodied in the new defense budget.

Congressmen will do well to scrutinize all military appropriations carefully. They have a chronic tendency to be too big. But there should be no penny-pinching on investments in capital equipment that will pay out in as short a time as six weeks in a war emergency. It would be tragic if this opportunity for real economy were lost in the controversy over other aspects of the defense program. ***The tooling program is a key part of the Eisenhower effort to cut defense costs. It should be promptly approved.***

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BATAVIA OHIO

attention of all the workers in the shop.

It is part of the foreman's job, and an important function, to impress upon each man the necessity for care in operation, and to point out clearly what the job involves, what the worker is to do, and how he should do it. The foreman should also follow up these instructions continually by seeing and knowing that his instructions are being carefully carried out.

In the case under discussion, the fact is brought out that the worker had the ill grace to misfeed the press which broke up the die and ruined the whole rush order. Where was the foreman during the period in which the worker was engaged in this rush job? It was clearly his duty to actually supervise the worker during this critical job. A foreman must be responsible for the use of all tools, machines and equipment in his department. He must direct the production of the part or product to obtain or exceed the specified quality at the lowest practical cost. He must have the leadership, ability, and knowledge to properly guide the efforts of his men effectively. He is responsible for planning the work of his section and for procedures for maintaining quality.

Under normal conditions, the foreman would indeed be too lenient with the careless worker if he did not fire him outright for ruining part of the company's business. However, other considerations should also be taken into account. Chief among them is the fact that the man was a long-time, skilled, and experienced employee, with an otherwise clean record. His skill would be highly missed in the operation of the shop with replacement conditions the way they are today. Ed seems to have hit upon the best solution: send the man home for a few days and let him stew over his sins. In this manner he can be re-

"—You gotta come home with me to dinner, Chief. It's the only way I can get a decent meal out of my wife!"

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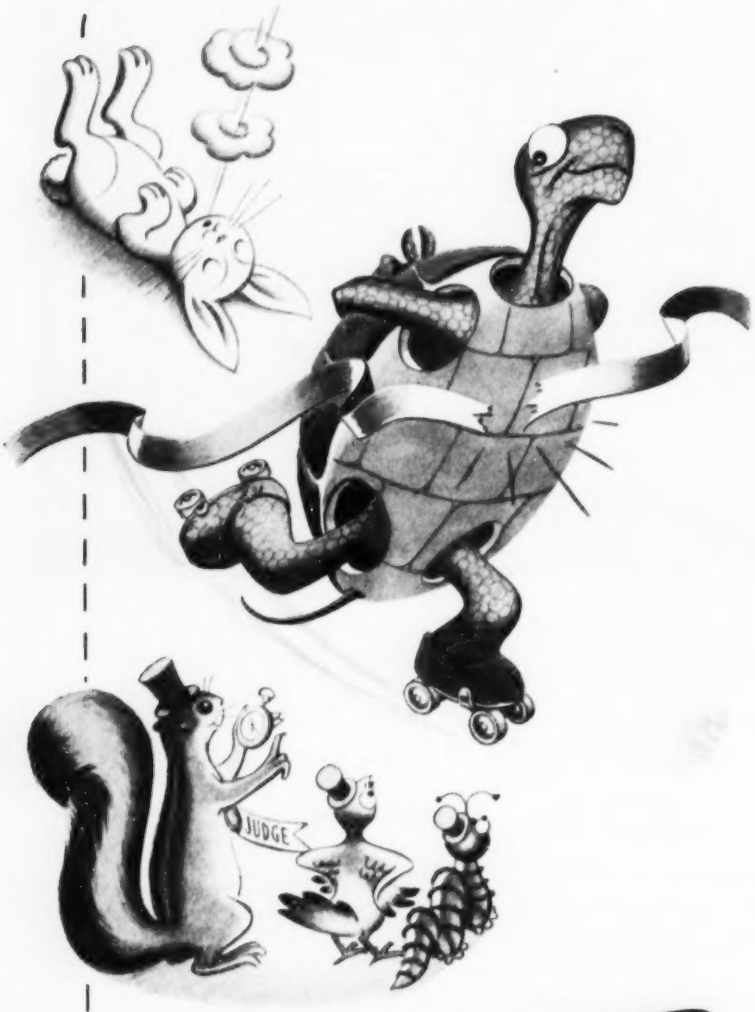

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trained for his normally good work and the foreman would have proved to the men that discipline was still existent and a factor in shop operation.

In one plant, in order to impress employees with the importance of cutting down on spoiled work and waste, the company exhibited such work in the plant and in its employee paper, with the dollars-and-cents cost in big figures. The attention directed to the monetary cost of defective work had a sobering effect. It emphasized that quality is never an accident; it is the result of discriminating judgment and care which is brought to skillful execution through sincere efforts of both worker and foreman.

Too many foremen consider themselves office executives, to be seen by the workers "by appointment only." On the other hand, there is the type of foreman I call the "frantic boss." This type feels that nothing can be done without him. He is so bogged down in detail that he has no time to set orderly policies. He never appears to know what he wants, never seems able to delegate responsibility. As a result, the shop is in constant turmoil. The happy medium is the type of foreman who plans his work, knows when to delegate authority and responsibility to subordinates, and keeps in close touch with his men; especially if they are engaged on important rush jobs.

In order to be a real director of men, the foreman must not only be good from the technical and mechanical standpoint, but also as a person. As an example, firing a man because he made one mistake, would be the easy way to handle the defective work problem. Finding out why he made the mistake is the right way to handle the situation. The man may have been on edge or worried about some family or financial condition. To ask him about it shows an even, judicial temperament

"and . . . were you wearing your goggles at the time the accident occurred . . . ?"

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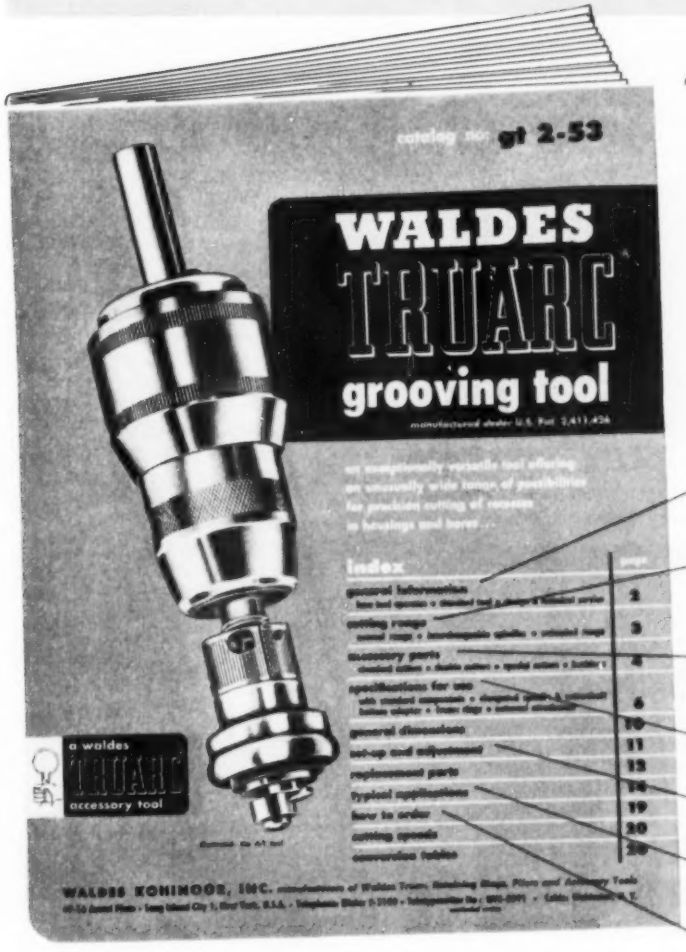

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Here is the most complete catalog ever published—on the cutting of internal concentric recesses. Complete with descriptive, illustrated information and data charts showing how the Waldes Truarc Grooving Tool can solve virtually every internal grooving problem you may have. Shows how even *unskilled labor* can perform precise, production-line operations.

Facts and figures on the Waldes Truarc Grooving Tool . . . its special features, modifications and adaptations.

Data showing how the Waldes Grooving Tool cuts accurate grooves in housings with diameters from .250 to 5.000 inches.

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Location of grooves under varying conditions: in bores, housings, and blind holes.

Diagrams and easy-to-follow instructions on the set-up of the Grooving Tool.

5 full pages showing 17 case histories covering the range of typical problems and solutions.

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MADE BY THE MANUFACTURERS OF WALDES TRUARC RETAINING RINGS.

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Waldes Truarc Grooving Tool manufactured under U. S. Pat. 2,411,426

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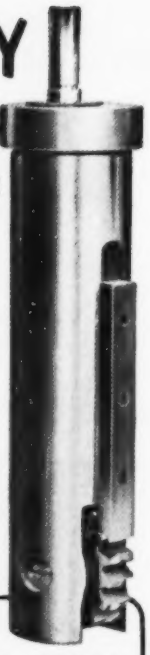
The INSIDE STORY about NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations that a keyseating machine can't reach. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed Rockwell hardened steel, accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

national
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CINCINNATI 22, OHIO

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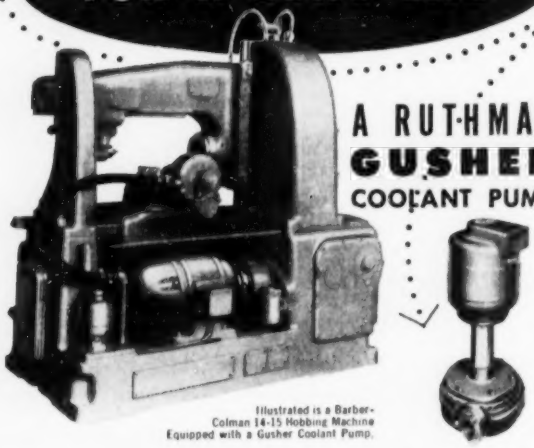
for Catalog No. 17
complete, handy size

FOR A LONG LIFE



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Illustrated is a Barber-Colman 14-15 Hobbing Machine Equipped with a Gusher Coolant Pump.

Every Gusher is specifically designed to give you long trouble-free service.
The rotating assembly is electronically balanced to eliminate vibration and wear. There's no metal-to-metal contact within the pump.
The overall construction is extremely simple with fewer moving parts.
Wear and maintenance costs are cut to a minimum.
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THE RUTHMAN MACHINERY CO.
1818 Reading Road, Cincinnati, Ohio

in a provoking situation. The man can be fired or forgiven after the facts are known.

When a foreman is selected and gets up to supervisory levels, when he stops handling tools and starts handling, people, an almost total reversal of qualification begins. Know-how is 90% for the rank-and-file worker. For promotion to foreman, know-how is 50% and human relations 50%. For promotion to executive, know-how is 20% and human relations 80%. I know of one company where the personnel manager named a man for promotion to a supervisory job for which he had little previous training. When asked why, he said, "We can teach that man all the know-how he needs in six weeks, but it has taken him 32 years to become the person he is."

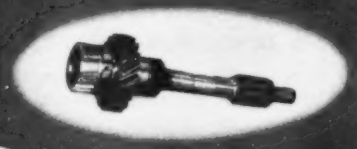
There is one thought that should be considered before severe disciplinary action is taken in this case of the alleged careless worker: "The gem cannot be polished without friction, nor men perfected without trials." In any event, the foreman should investigate first whether the cause of the spoiled work was due to plain carelessness, or possible defects in the die whose inherent faults may have made misfeeding too easy. If investigation proves that the man's carelessness was the cause of the defective work, proper disciplinary action consisting of loss of pay for several days would maintain shop discipline and have a salutary effect on both the offender and the rest of the men, and at the same time retain the services of a hard-to-replace skilled worker.

It is unfortunate that a foreman sometimes has to learn the hard way that it is best to know the mental and physical condition of a worker before putting him on a critical rush job. Putting a worried man on a critical job is inviting trouble. If meeting a deadline is involved, the man with something else on his mind may be careless-prone. Give him

"If his first name is 'Simon' I quit!"

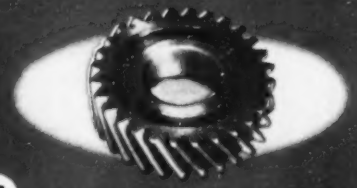
GEARS SHAVED in 12 to 20 SECONDS

Finishing precision gears to close tolerances on tooth profile, index, eccentricity and tooth surface smoothness on Red Ring Shaving Machines is a high production operation as indicated by these random examples.

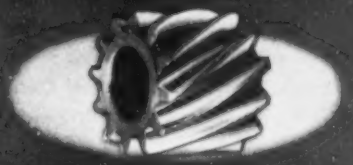


A SHAVING TIME 16 SECONDS

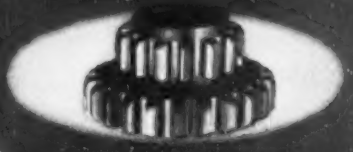
B SHAVING TIME 16 SECONDS



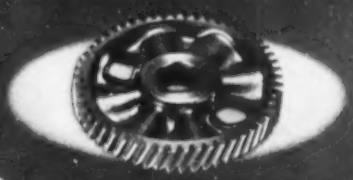
C SHAVING TIME 20 SECONDS



D SHAVING TIME 12 SECONDS



E SHAVING TIME 15 SECONDS



F SHAVING TIME 20 SECONDS

GEAR CHARACTERISTICS

Gear	Stock Removed Over Pins	Material	No. of Teeth	PD	DP	Face Width
A	.010"	Steel	19	2.4"	9.25	⅛"
B	.010"	Steel	29	4.00	9.25	1⅛"
C	.010"	Cast Iron	28	2⅛"	10	1⅛"
D	.005"	Steel	12	1⅛"	13.5	1"
E	.006"	Steel	14	2⅛"	6/8	1⅛"
F	.012"	Aluminum	54	5⅞"	10/	⅛"

WRITE FOR DESCRIPTIVE LITERATURE ON *Red Ring Gear Shaving*

SPUR AND HELICAL GEAR SPECIALISTS

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH & MACHINE CO.

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ever see yourself in a gear

If you require gears having faces and shafts of mirror-like smoothness, you'll be interested in this Cincinnati Gear service. *Superfinishing* is available to provide gears with surfaces of minimum microinch tolerances. This is just one of the many "extra" services we offer . . . another reason why more and more gear buyers rely on The Cincinnati Gear Company for *all* their custom gear needs.

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Producers of fine tool steels—High Speed Steels
Die Steels—Hot Work and Shock Resisting Steels
Carbon Tool Steels.

TOOL COLUMBIA STEELS

another job for a while until his outside troubles can straighten themselves out.

Putting a skilled worker on a critical rush job may be an easy solution to meeting a deadline, but this neat arrangement may defeat its own purpose if the foreman is unaware of the man's troubles outside of the shop. A good foreman makes it his business to know the human problems of his working force as well as guiding them in the operation of their machines.

Harry Kaufman
Philadelphia, Pa

•

NOT-SO-SWEET CHARITY

How should fund raising be handled in the shop? Should each individual be assessed a specific amount, or is it fairer to leave it up to the man as to how much he should or can contribute? Who should be responsible for quotas or collections?

Should a foreman be held responsible for charity quotas in his department? What next? If a foreman looks properly after the work he is engaged to do, and paid to do, his time will be fully occupied. The community spirit has its points but so has the individual spirit which must be encouraged and supported if free enterprise is to survive. The community spirit savors too much of communism to appeal to those independent spirits of all nations who are the inspiration and linch-pin of progress.

Al's suggestion of an unofficial welfare fund is not a suitable organization for foremen to be actively or even passively identified with. Foremen are actually officials of the company and their presence as collectors would be sure to arouse the resentment of the purists among the community enthusiasts. Of all the company officials, the foreman is the most actively in touch with the men and it is he who has the greatest responsibility in holding the scales equally balanced between the company and the workers. This is no light task, and nothing should be fathered on to a foreman which is likely to make that task more difficult. Were it the foreman's responsibilty to raise money for charitable purposes, the fund would benefit or suffer in direct proportion to the foreman's popularity with the men.

It should be noted that all foremen are not suited to work such as this and that the foreman in any given shop might conceivably be the worst possible choice so far as the fund was concerned. One of our fore-

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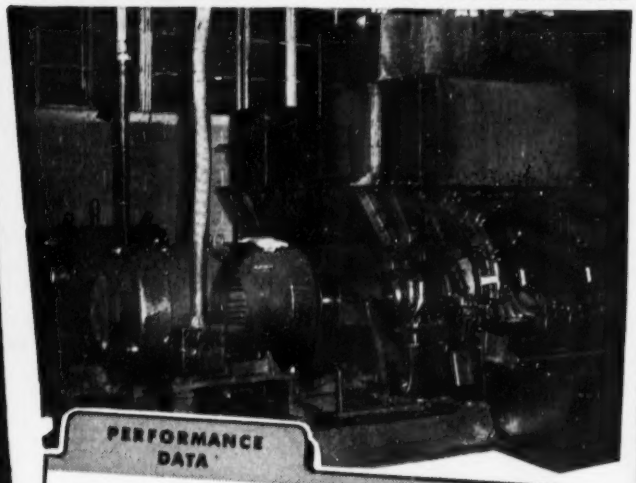
More "CRUSHING" FACTS ON American CRUSHER PERFORMANCE

Case History No. 15

$60,000 ANNUAL GROSS PROFITS! WITH TWO AMERICAN METAL TURNINGS CRUSHERS



PERFORMANCE DATA

TWO CRUSHERS:	Model 3800's
AVERAGE AGE:	35 months
MONTHLY TONNAGE:	1200–1500 tons metal turnings
PARTS COST:	to date, for both crushers: $1599.80
COST PER TON:	$0.03, including standby parts

THE experience of many blue chip manufacturers have shown that there are three important profit sources in every American installation: (1) American-reduced chips bring $4 more per ton on scrap market (2) Up to 50 gallons of recovered cutting oil per ton of reduced turnings (3) less storage . . . easier handling.

Let American show you how you can turn your scrap into profit.

WRITE for Bulletin: "Metal Turnings Crusher."

American PULVERIZER COMPANY

1523 MACKLIND AVE., ST. LOUIS 10, MO.

men who debated the matter put his point briefly to the discussion group meeting, "Good foreman are not necessarily good debt collectors." It was suggested by another that although the foreman might be *responsible* for charity quotas, someone else, over whom the foreman would presumably have authority, could do the actual collecting. This brought the foreman of the finishing section to his feet to point out that Training Within Industry roundly condemns two men on a job which one could do. Quite a few voiced the opinion that the average foreman's duties are sufficiently onerous to discourage him from adding to them, even in the sacred name of charity. One man was insistent that appointing a foreman to be responsible for charity quotas would be resented by the men as possibly the thin end of the wedge called "compulsion" and he got quite a lot of support for his argument in favor of Al's fear that, in time, the charity contribution could easily become a paycheck exaction.

The best way to raise money for a worthy cause is to give the givers pleasure and interest in giving. Merely to collect contributions in money arouses enthusiasm in neither the collector nor the giver. Some form of entertainment or competition that will take everyone in, in the best sense, of course, has more permanence than merely begging which all concerned soon tire of. Dramatic clubs, opera, concert parties, swimming clubs, gym clubs, badminton clubs, almost any winter pastime, in fact, can stage shows and competitions. In summer time, sporting events with side shows can be revenue raisers if properly organized and supported. The volume

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Double your drill press output for $33.00

Mead Drill Press Feed mounted on spindle quill of drill press

DRILL PRESS FEED NO. 1
Specifications: *Power factor, 4 times line pressure; Stroke, 2½" (approx); Bore, 2³⁄₃₂"; Capacity, ½" steel; Weight, 2 lbs. (approx).*

Use a new MEAD *pneumatic drill press feed for* DRILLING, TAPPING, REAMING

This simple, inexpensive device quickly converts standard drill presses into semi-automatic machines; doubles production on suitable jobs in many cases. Clamps to spindle quill in a few seconds. Automatically closes air fixture on work. Adjustable feed control and break-through cushion. Quick return. Easy to synchronize with automatic cycle equipment. Fits any size press up to 2⅛" spindle diameter. Use genuine Mead Pneumatic Drill Press Feeds for faster, cheaper, more profitable production. Get the facts—send coupon.

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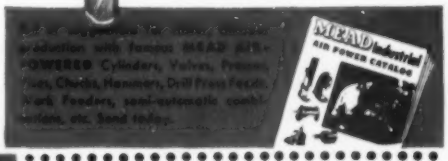

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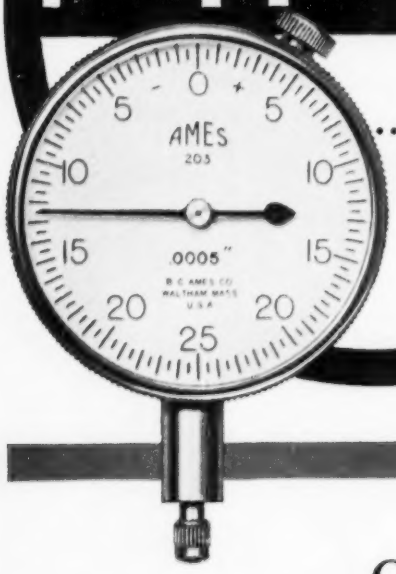

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The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.

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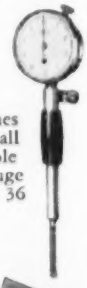
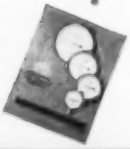


Ames Small Hole Gauge No. 36



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of support would depend on the quality of the fare on offer and with a few charity enthusiasts in charge to organize the several events a lot of cash can be collected and a lot of enjoyment experienced by the employees when their interest is thoroughly aroused. Fever heat of enthusiasm is reached when several different plants in one town or district engage in friendly rivalry, and although more work is involved than in merely begging, it is work of an enjoyable and instructive nature. There is usually much high-spirited youth around most plants, waiting for some one to suggest, advise, and train them and that reservoir of talent need only be tapped and harnessed to provide ample funds for a reasonable charity program. The older employees can make a useful contribution organizing, training, coaching, and producing. Thus all benefit, the young by interesting and instructive activity, their elders by guiding and teaching, all employees and townfolk in general by shows, displays and sports events, and the fund benefits from new money raised, not merely by paying something in to get it out again.

On the slightly baser side, a classic example is that of the cashier of a nearby plant who was not satisfied with his weekly pay packets and decided to raffle it. The number of employees was considerable and such was the demand for tickets, they were selling all over the town. At his first attempt his profit was treble his pay and he gradually went on from strength to strength till the boss got wind of the venture and put his foot down. Games of chance appeal to all of us, and within the law and in sensible moderation they can be a source of much amusement and some profit at side shows on a sports gala.

Money can be raised, of course, when all employees agree to make a weekly or monthly contribution to a given fund for holidays, sickness,

"Now, now, don't let those night-shift jokers get your goat."

Save time... slash costs... switch to Black & Decker POWER!

YOU don't have to be an engineering genius to sell yourself on Black & Decker Tools! Their performance hits you right between the eyes as they gobble up job after job . . . saving money, muscle and man hours. Their modern design sticks out in streamlining, light weight and perfect balance that mean easy handling. And their quality construction is proved by tools that put out and pay off for year after year after year!

That's why they've won their spurs with millions of men who take a long, hard look at *any* tool . . . production bosses, maintenance men. That's why we'd like *you* to put them to the test. Ask your friends about them. Ask your nearby Black & Decker Distributor for a demonstration. Write for our free, detailed catalog of over 100 time-saving, cost-cutting Portable Electric Tools to: THE BLACK & DECKER MFG. CO., 604 Pennsylvania Ave., Towson 4, Maryland.

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For fabricators of metal stampings requiring dependable, long-life equipment for jobs involving speeds of 25 to 30 strokes per minute, and where work is to be done high up on the stroke (i.e. production runs of deep-drawn parts), Warco offers an advanced line of single-point, two-point, and four-point Eccentric Gear Presses.

From the four-piece welded steel frame to the steel gears and heat-treated pinions, Warco Presses are designed to give maximum performance. They incorporate such advantages as welded steel slides with barrel-type adjustment, and air counterbalance — Warco's popular pneumatic friction clutch and brake unit with simplified push button controls — and many other features that enable Warco Presses to deliver at peak production with utmost safety — features that are constantly increasing the demand for Warco Eccentric Gear Presses.

Federal® WELDERS

THE FEDERAL MACHINE & WELDER COMPANY

WARREN, OHIO

Warco PRESSES®

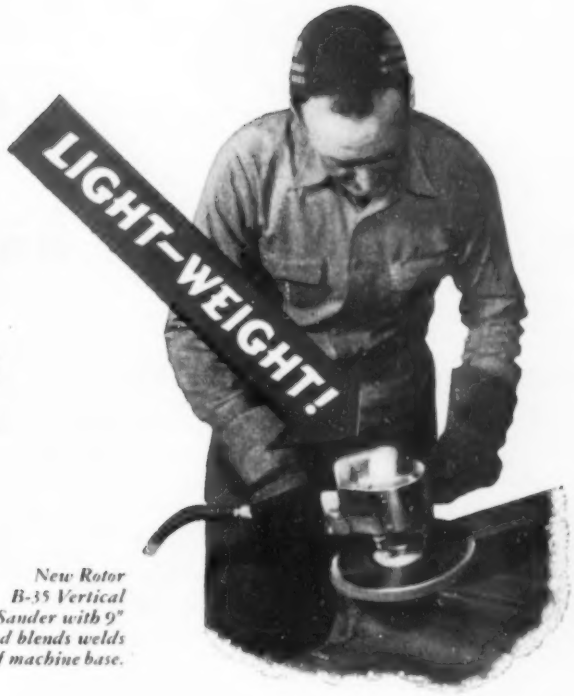
or amusement but that is not raising money in the best sense; it is merely banking it. No new money comes in except, perhaps, the bank interest. It is a tame and unimaginative proceeding and there is no fun or risk attached. I don't want to labor the point but, in this connection, I am a confirmed believer in making money for charitable purposes by offering something in exchange for that money and, at the same time, giving the young people something useful, instructive, and amusing to do in their spare time.

The welfare, or club idea, has many applications and has its uses. There is a tool works in Scotland, built some sixty years ago, who engaged an American named Manville to come over here to lay it out and be its first manager. In those days, fine measuring tools such as micrometers were somewhat rare in Scotland; the employer did not provide them, and Mr. Manville instituted a scheme similar to Al's proposal, to encourage the men to acquire the latest American tools. It was called the tool club. When enough money had been contributed, a number of American tools were purchased and lots were drawn for them; this was repeated till almost every man in the shops boasted a kit of the latest American tools. The club idea took root and, eventually, an unofficial sickness and holiday club emerged, run entirely by the men who visit the sick and pay out the benefits. All sickness is covered, so much holiday money is paid out in summer, and at the end of the year all but a small bank balance is divided equally among the members. An agreed bank balance is retained and the whole process starts anew with each new year. That shop is still going strong today and, among other things, I help to manage it.

M Donald
Lanarkshire, Scotland

"Another thing to remember — don't watch the welder strike an arc."

New Rotor B-35 Vertical Grinder with 6" cupwheel smooths a casting.



New Rotor B-35 Vertical Sander with 9" pad blends welds of machine base.

Speed up the job with these NEW ROTOR VERTICALS

YOU should try these new Rotor "power houses"! See how fast they remove metal. See how easy they are to handle . . . light in weight (only 10¼ lbs.) because of magnesium castings . . . comfortable balance because of adjustable handle angle.

Ask for a demonstration! Write for free copy of Catalog No. 40.

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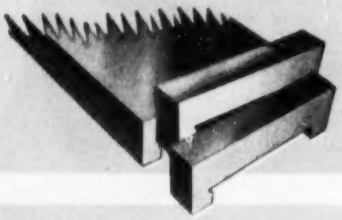
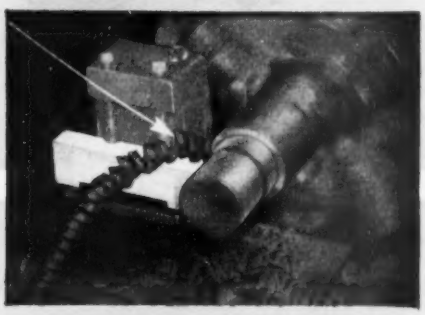
ONE CUSTOMER SHOWED US BY:

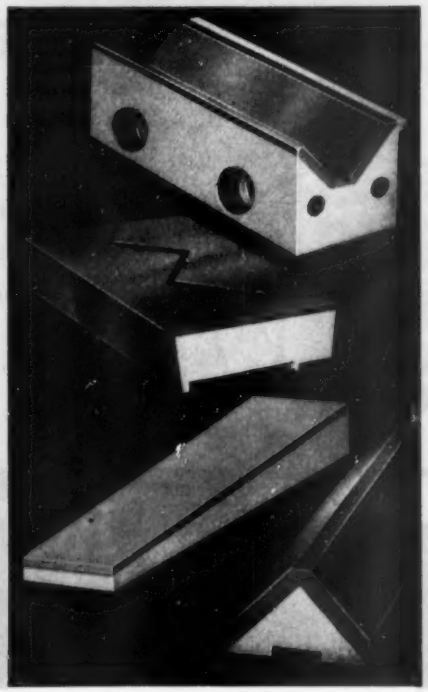
1. Taking a section from an OK bedway



2. Making it into a "tool bit"

3. Then cutting metal with it (1045 cold rolled steel)





The Gisholt Machine Co., Madison, Wisconsin, who use Ohio Knife bedways exclusively on their ram and saddle type Turret Lathes, made the above dramatic test for one of their customers. RESULT—another sale of a famous Gisholt Turret Lathe.

This super uniform hardness on the wear surfaces to a depth of 3/16" (64-66 Rockwell "C") is the reason why more and more OK ways, gibs, races, etc.. are being specified on new equipment and used as replacements where former parts have failed. OK ways are practically wear proof assuring constant accuracy throughout the life of your machine. Enjoy with many prominent machine tool builders and users, the long wearing, supreme accuracy, super hardness of OK ways. Many sizes, shapes, etc., available, or made to your specifications.

OK wear strips are now available in welded Ampco bronze.
(Reg. U. S. Pat. Office by Ampco Metal Inc.)

Manufacturers for the Metal Working Industry of:

SLITTER KNIVES • SHEAR BLADES • ROTARY SHEAR KNIVES
HARDENED SPACERS • HARDENED WAYS • GIBS
BALL RACES • BRONZE WAYS • WEAR STRIPS

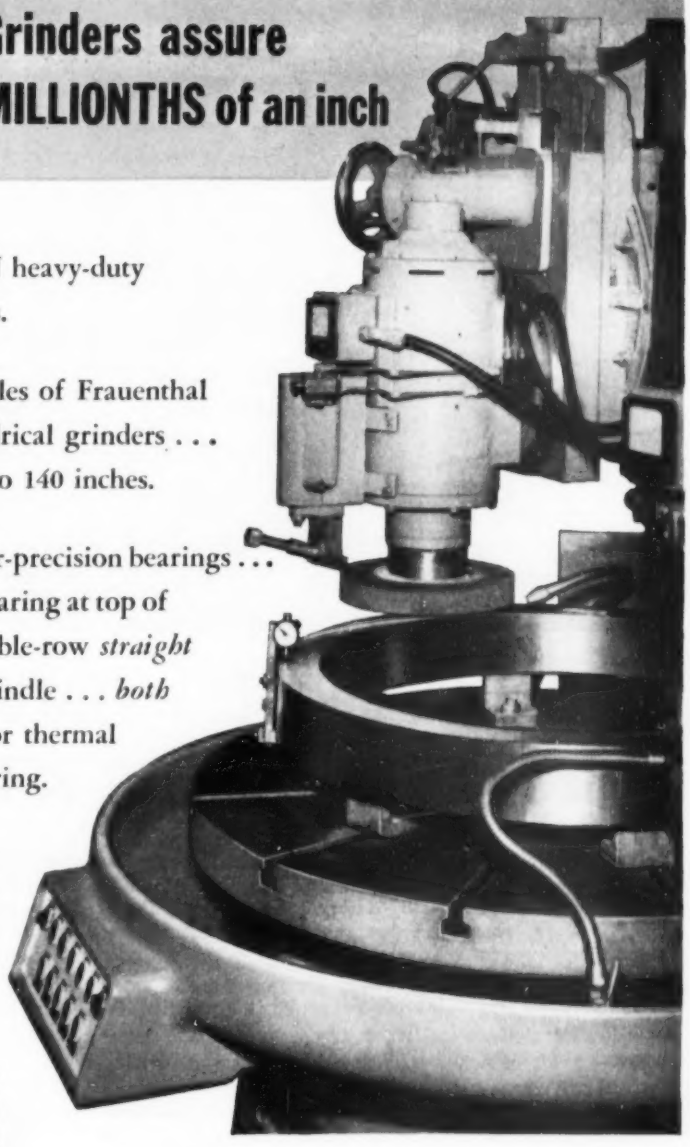
Write for comprehensive Bulletin to Dept. W

GO WITH OHIO GREEN

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

WHY Frauenthal Grinders assure precision to MILLIONTHS of an inch



HOW? By use of KAYDON heavy-duty super-precision, pre-loaded bearings.

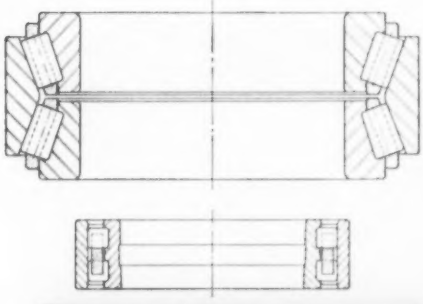
WHERE? In the table-spindles of Frauenthal Double-Head super-precision cylindrical grinders . . . table-sizes ranging from 30 inches to 140 inches.

WHAT? Two oversize, super-precision bearings . . . one is a double-row *tapered* roller bearing at top of table-spindle . . . the other is a double-row *straight* roller bearing at bottom of table-spindle . . . *both preloaded* and designed to allow for thermal changes without affecting upper bearing.

Precision-Proven for over a decade

For over 10 years Frauenthal Grinders have been performance-proved on precision grinding of parts for aircraft, jet and automotive engines, tanks, gun mounts, radar units, Diesel parts, valves, large precision bearings and other precision parts and assemblies.

Cross section of both bearings



Let's discuss *your* grinding problems

With these modern grinders, you can make many combinations of grinding-spindle positions for a wide variety of simultaneous grindings of outside and inside diameters or faces, to extremely close tolerance of .000200" (200-millionths of an inch) *or better*. Valuable grinding, boring, turning details on request.

In 10 standard sizes, conforming to J.I.C. specifications

	Series 1800				Series 2000		Series 2200			
Table sizes	30"	36"	42"	48"	60"	72"	110"	120"	130"	140"
Maximum swing	60"	60"	60"	60"	72"	88"	120"	130"	140"	150"

Frauenthal

MULTIPLE-HEAD SUPER-PRECISION CYLINDRICAL **Grinders**

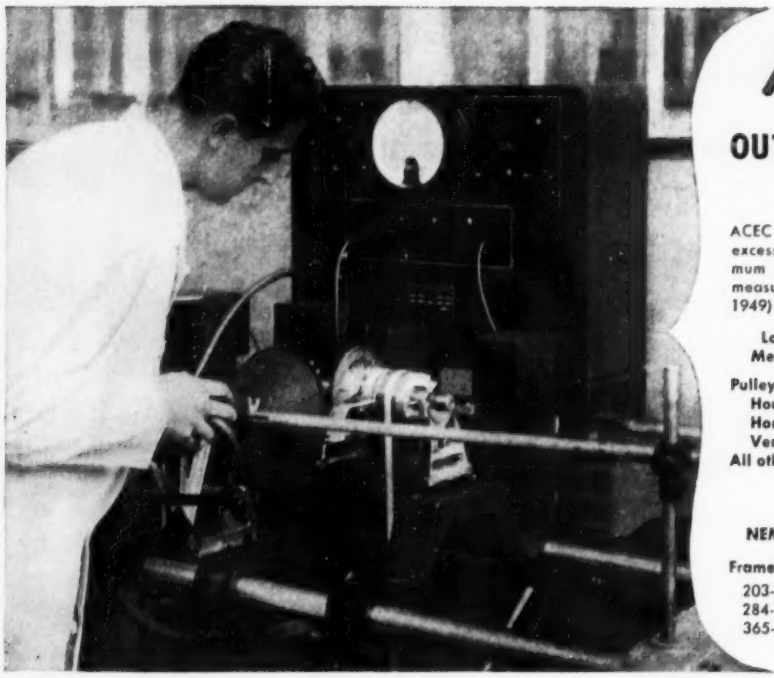
PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY TO MILLIONTHS OF AN INCH!

write for bulletin

Frauenthal Division

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN



ACEC

OUTSTANDING DYNAMIC BALANCE

ACEC Motors are dynamically balanced far in excess of NEMA standards at no extra cost. Maximum amplitude of vibration of ACEC Motors measured according to NEMA-MGI-4.21 (Oct. 1949) specification.

Location of Measurement	3 HP 1800 RPM	5 HP 1800 RPM
Pulley End Bearing Housing:		
Horizontal Amplitude	0.00035	0.00025
Vertical Amplitude	0.00025	0.00025
All other parts of Motor	0.00020	0.00015 to 0.00020

NEMA (MGI-4.20) Recommended Standard

Frame Sizes	Amplitude in Inches
203-254	0.00100
284-364	0.00150
365-505	0.00200

THESE QUALITY + FEATURES SHOW WHY ACEC MOTORS DELIVER BETTER PERFORMANCE

Dynamic balancing far in excess of NEMA Standards, as shown above, practically eliminates vibration. Equal load distribution on bearings obtained in ACEC design greatly prolong life of these bearings—assures a longer lasting, smoother running motor *at no extra cost to you.*

Tightly sealed bearing enclosures keep lubricant in and dirt and foreign particles out. ACEC motors operate at any angle.

Rounded stator slots top and bottom assure tighter fitting stator windings—eliminate voids that collect dirt and moisture, shorten insulation life.

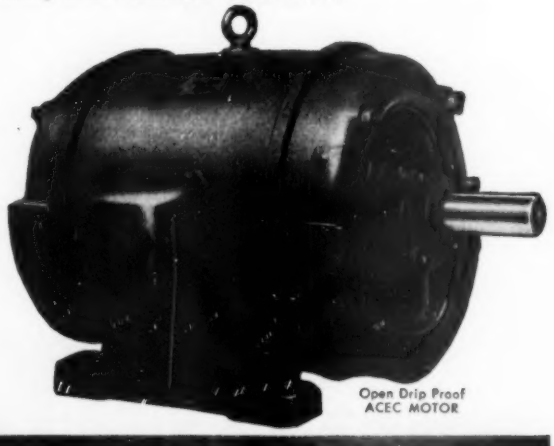
"Baked-on" insulation. Oven-dried polyvinyl-acetal insulated windings receive two additional coats of "baked-on" plastic insulating varnish for maximum dielectric strength.

Simple, rigid assembly results from cast iron frame and end shields and use of 4 through-bolts with 8 nuts. End shields can be removed without disturbing bearings on shaft.

Rigid quality control maintains quality of materials used in ACEC motors within the narrowest limits. Every motor receives thorough testing—carries a factory guarantee.

ACEC Motors offer these and many other quality features, *yet they're priced below most other motors.* Manufactured strictly to NEMA Frames and Specifications by one of the world's largest electrical manufacturers, they are available in a wide variety of types from **300 ACEC Distributors and Service Shops** across the nation.

No matter what your motor requirements, it will pay you to investigate ACEC's top-level performance *at lower prices* by writing to the addresses listed below.



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Los Angeles: 423 E. 3rd St. MAdison 6-4421

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and in any location

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WRITE TODAY for the unique Crucible Tool Steel Selector, 9" diameter, in 3 colors — a twist of the dial tells you which tool steel is best for your application. Address your request to Crucible Steel Company of America, Dept. A, Oliver Building, Pittsburgh 22, Pa.

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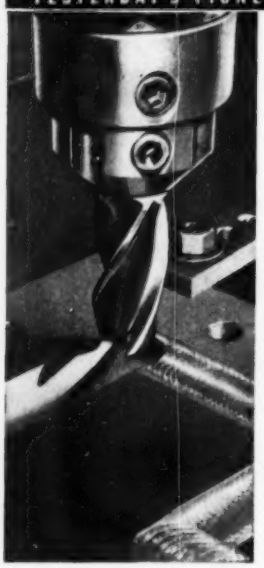

HEAVY DUTY END MILLS and HOLDERS

(Both are Stock Items)

● Look at this rugged 2″ diameter Weldon end mill with 4″ long flutes which made a 2½″ deep cut in a solid block of die steel—4140 steel heat treated to 260 Brinnell. The feed was 1½″ per minute, and the material was removed at a rate of 7½ cubic inches per minute.

This HEAVY DUTY Weldon end mill is held by a new-style end mill holder which bolts securely on to the nose of the milling machine spindle. The holder, located by a centering plug, is driven by two drive keys on the spindle nose. The 2″ diameter shanks of these heavy-duty end mills are securely held by two large hollow head screws.

For top performance and sturdy long life in end mills—large or small—look to Weldon.

Weldon distributors throughout U.S.A. and Canada carry complete stocks to serve you

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cut pump-down time in half!
increase operating efficiency!
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● **Removes moisture from vacuum pump oils; cuts pump-down time in half...** Keeps oil clean and dry. Enables pump to provide a high vacuum *without oil change* and eliminates pump "drying out" maintenance!

● **Eliminates changing or discarding of oil; allows maximum pump operating efficiency...** Increases production due to less downtime. Actually provides 2-way protection—filtering out contaminants from oil as it separates water!

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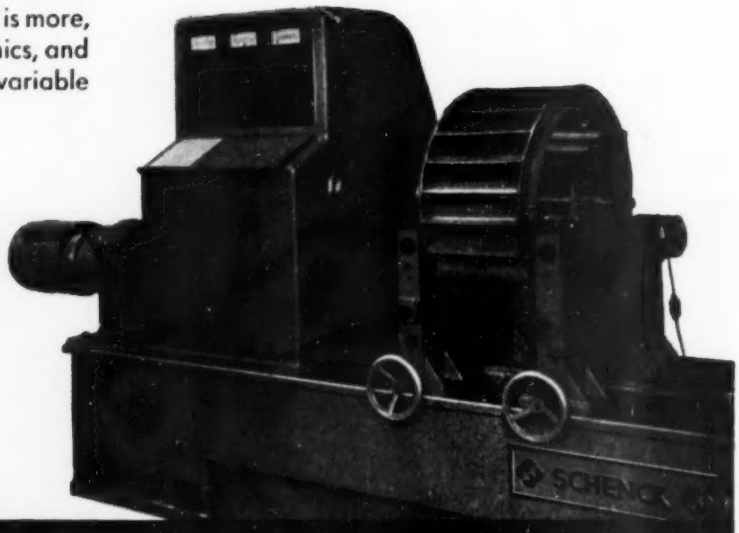

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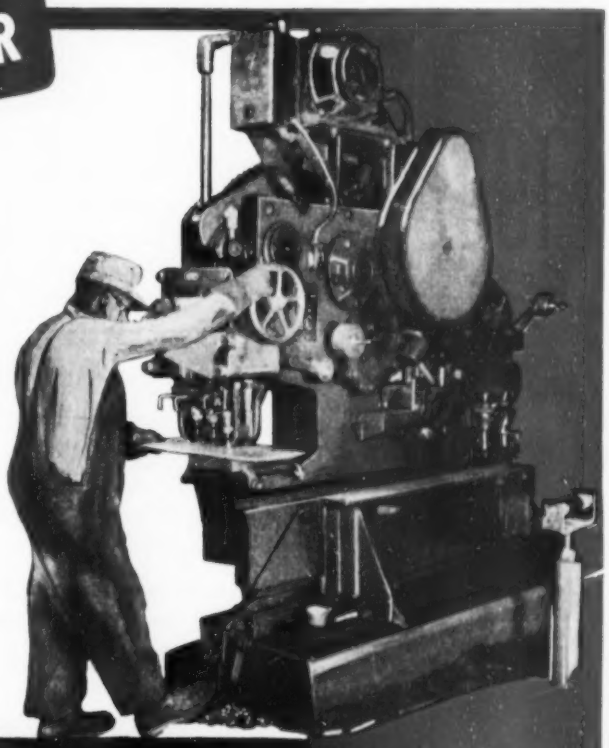
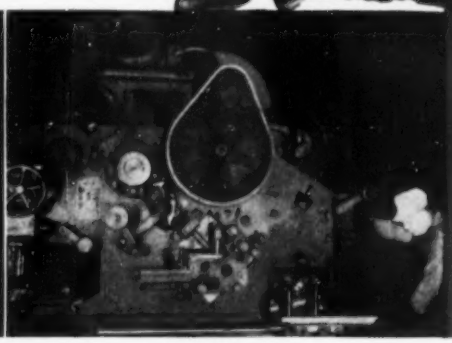
Why give space to five machines to do the operations above, when this one machine can do them all? And it can handle up to three operations at once! Think of the space, time and money this powerful, versatile machine can save in your shop. Write for Bulletin 360D and see the five models available to speed up fabrication on your angles, tees, flats, channels, rounds and squares!



Cutting a 3 x 3 x ¼" angle



Slitting a ⅜" tee

Punching 13/16" holes in ½" steel with triple punching attachment.

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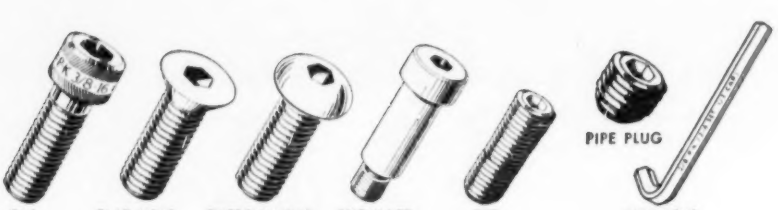
If you think there has been no change in such fasteners since 1930, you haven't seen Parker-Kalon *Ground Thread* Socket Set Screws.

Their clean, smooth, shining threads assure easy keying, and faster assembly. But equally important is the design prestige P-K Ground Thread Socket Set Screws give any product. Any buyer associates modern engineering and top-most quality with a gleaming thread finish he has seen before only on costly set screws of instrument precision.

Compare them with any cut-thread socket set screws and you'll see the day-and-night difference. Then specify "P-K *Ground Thread*" on your next order. Put your product out in front, assembly-wise and sales-wise.

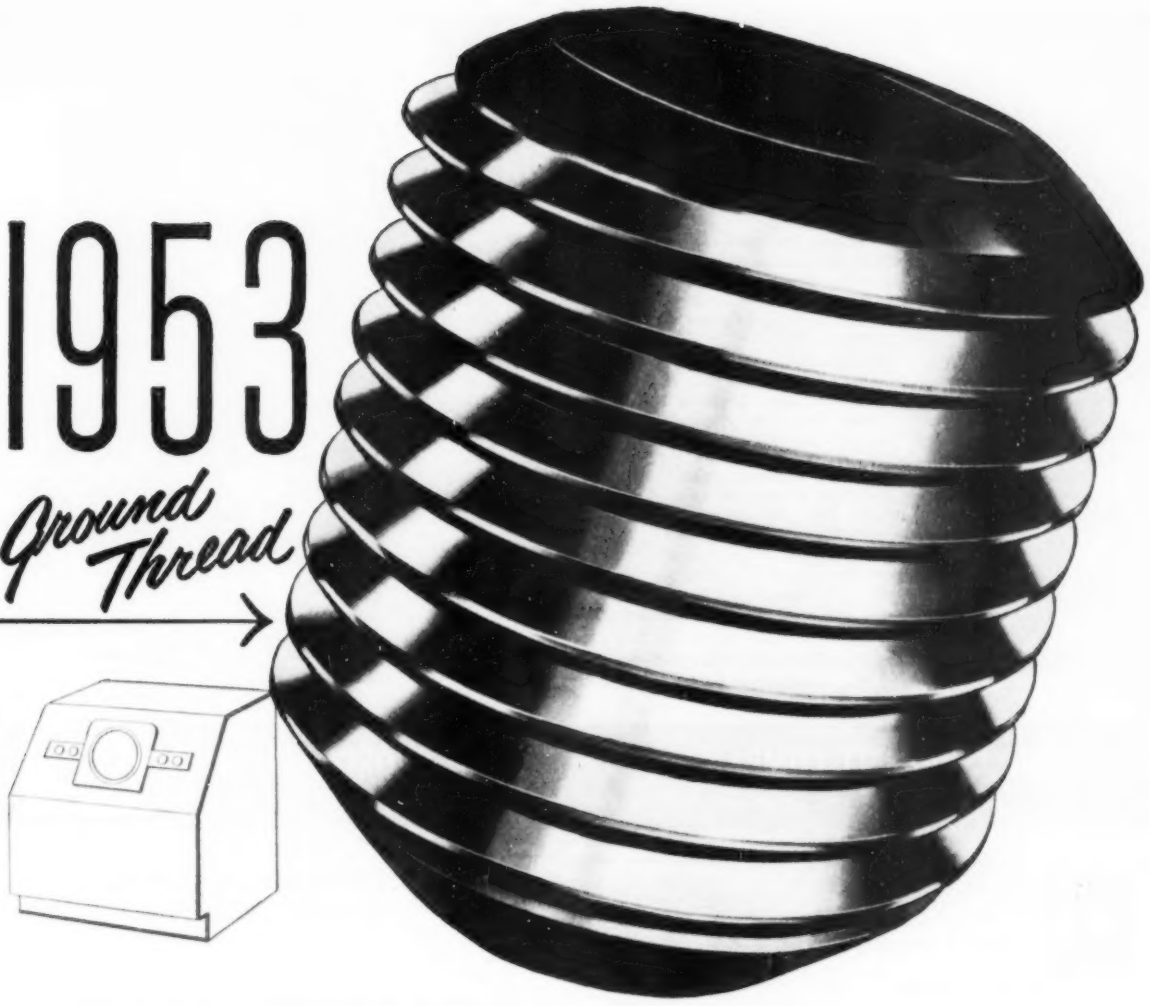
For SAMPLES, ask your P-K Distributor, or write: Parker-Kalon Corporation, 200 Varick St., New York 14.

Good judgment calls for [redacted]



1953

Ground Thread



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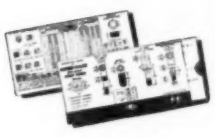

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Helps you plan assemblies. Pocket-size plastic chart gives essential dimensions of all types of P-K Socket Screws. Includes Set Screw Point Dimensions, and Thread Length Formula. Available FREE from your P-K Distributor.

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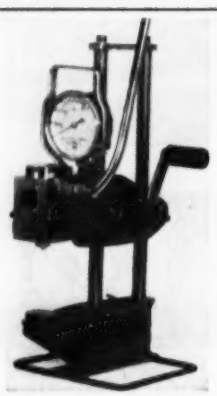

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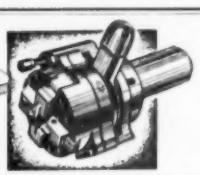

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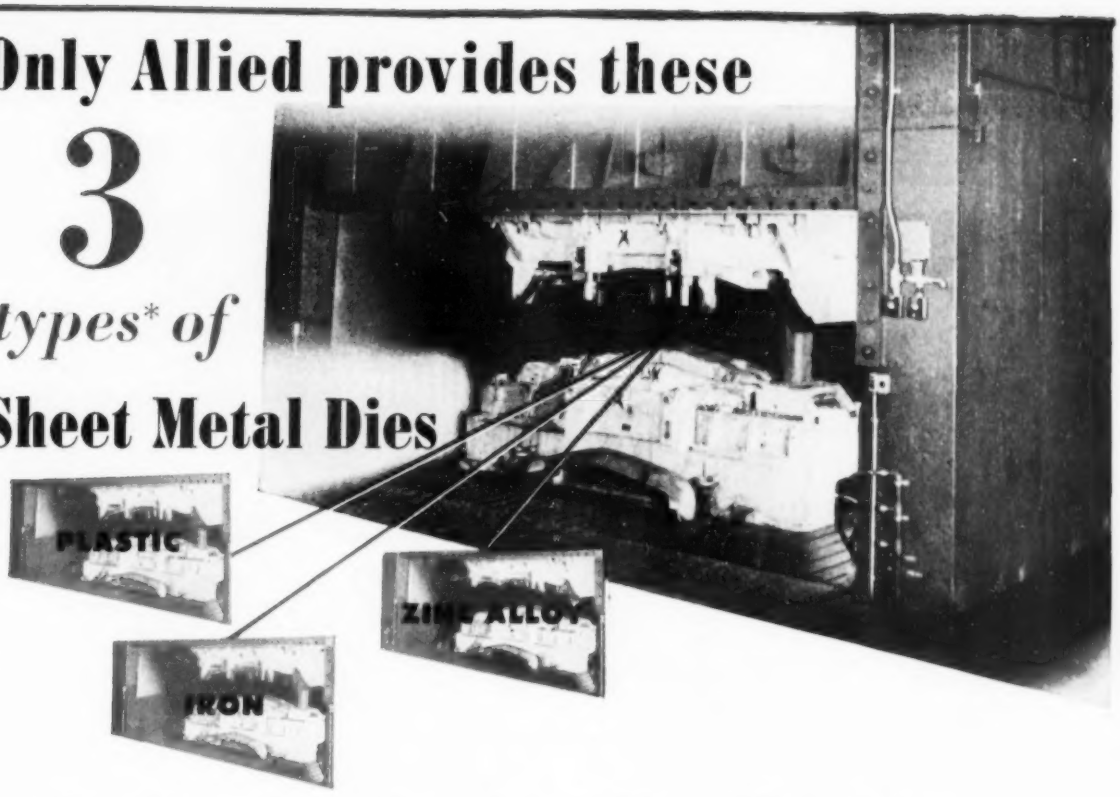

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**Combinations of materials are also used.*

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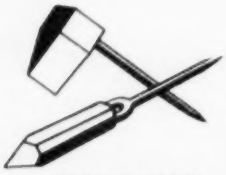

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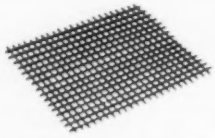

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Boston	Dallas	Indianapolis	Minneapolis	Philadelphia	St. Louis	(†sales office only)

TOUGH STUFF

Axelson lathes make your tough jobs easier, delivering constant precision work, even under the most difficult operating conditions. This chip, a sample of the rugged cuts Axelson lathes can make, is from a ship shaft of #6140 chrome vanadium alloy steel, $13\frac{1}{2}$" in diameter. Cut was made at 66 s. f. m., feeding at .050 per revolution; depth of cut 1". Tough stuff? Sure, but it's easy when you use an Axelson lathe.

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—and how it can cut tap costs up to 75%!

Leading metalworkers find the B.P.S.* System reduces their tap costs by 50 to 75% — and more! And the same profitable plan is available to *you!*

B.P.S.* SYSTEM ALWAYS WORKS!

These two simple processes *cannot* fail: (1) Sharpening flutes and chamfers of taps to an exceptionally high degree of accuracy (possible only on Blake grinders) and (2) Sharpening your taps at *regular, planned* intervals.

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*Blake Precision Sharpening

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- Gives much more production per tap!
- Greatly reduces tap costs!
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- Greatly reduces tap breakage and spoiled or unacceptable work!

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Blake Diamond Precision Drill Grinders • Waltham Cutter Sharpeners • Surface Finish Standards

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How Sylvania fashions fluorescent fixtures

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PAINTING . . .

ASSEMBLY . . .

Three major departments at Sylvania's Wheeling, W. Va. plant are typified in this *American Machinist* Special Report: materials inspection, the cleaning and painting line, and assembly.

For the first time anywhere, methods of making fluorescent lighting fixtures are described here. At this plant, as many as 200 fixture types are in production in a given month, of a total of over 600 types manufactured. Daily output runs as high as 4000 fixtures, yet blanking lead time over assembly is only seven days, painting lead time four or five hours. This demands careful production control, particularly because of wide variations in quantity between types.

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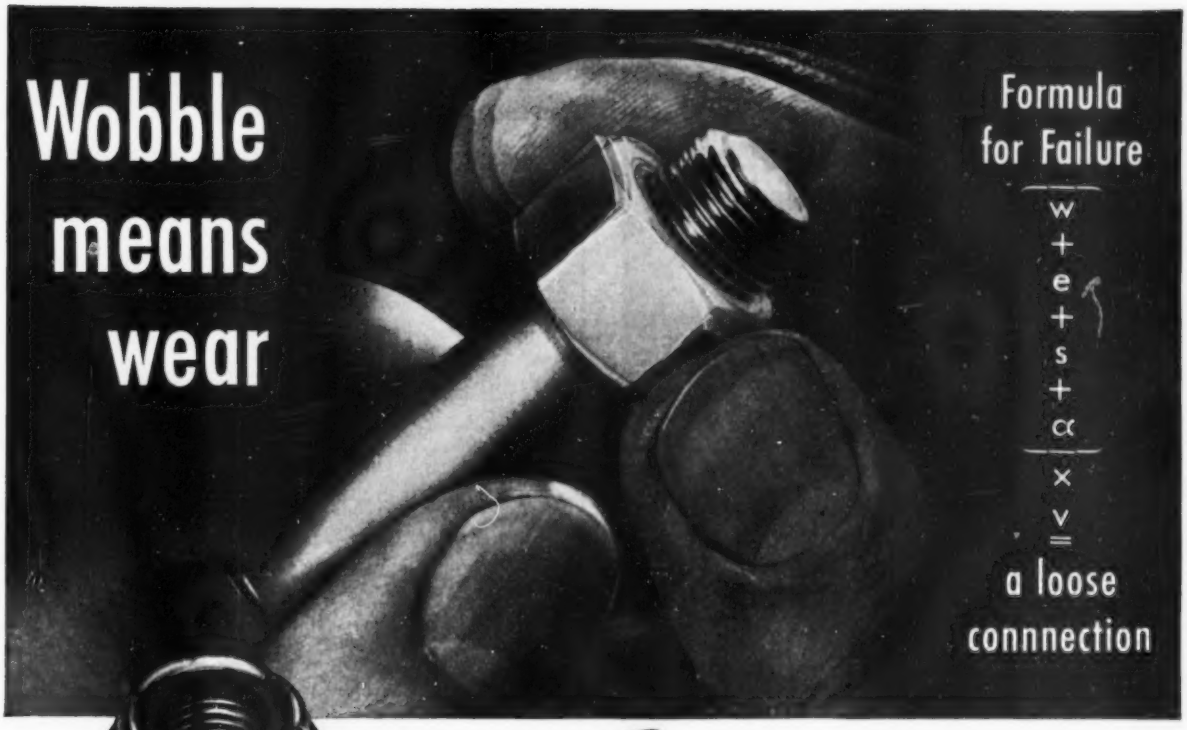

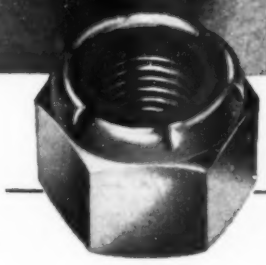

Elastic Stop nuts can't wobble

Formula for Failure—[(w) Initial thread wear + (e) bolt stretch + (s) thermal expansion or contraction + (α) wobble] × (v) vibration = a loose connection.

WOBBLE, permitted by normal axial thread play, and vibration are two of the major elements contributing to thread wear, loose connections and ultimate failure of a threaded fastener.

One device — the elastic locking insert — eliminates axial play and dampens destructive, wear-producing vibration. Because of the locking action of ESNA's famous red elastic collar, ELASTIC STOP nuts *do not loosen under vibration.*

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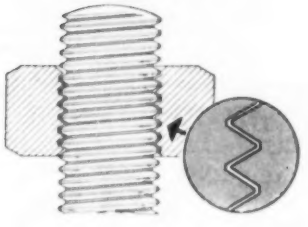
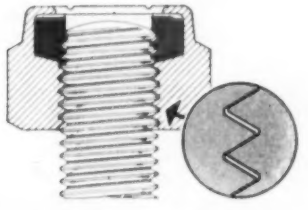


YOU CAN WOBBLE AN ORDINARY NUT AND BOLT with your fingers. This is the result of the tolerance spread permitted by the several classes of thread fit.



GRIPPING THE BOLT WITH A PERFECT FIT, ESNA's red elastic collar enforces a constant downward pressure that eliminates axial play, enforcing a positive contact between load-carrying sides of bolt and nut threads.

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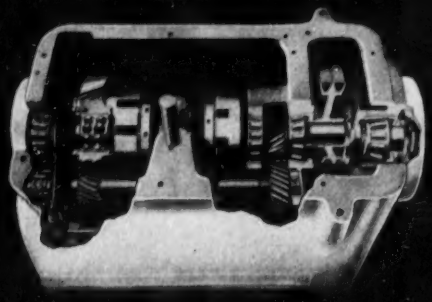

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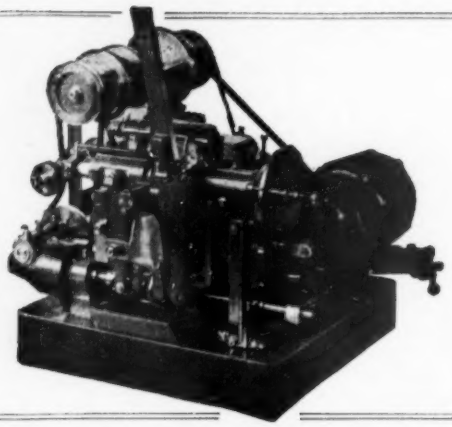

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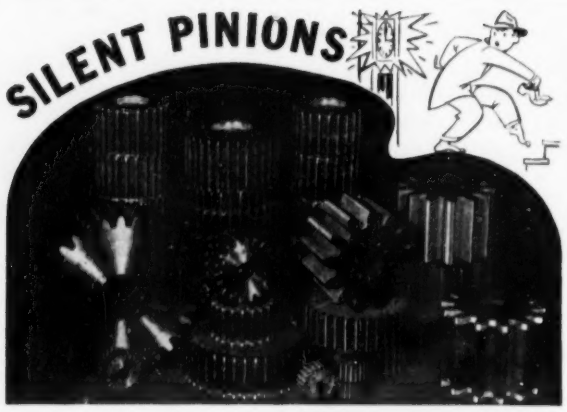

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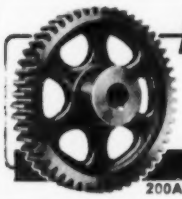

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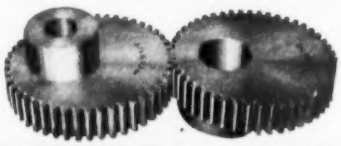

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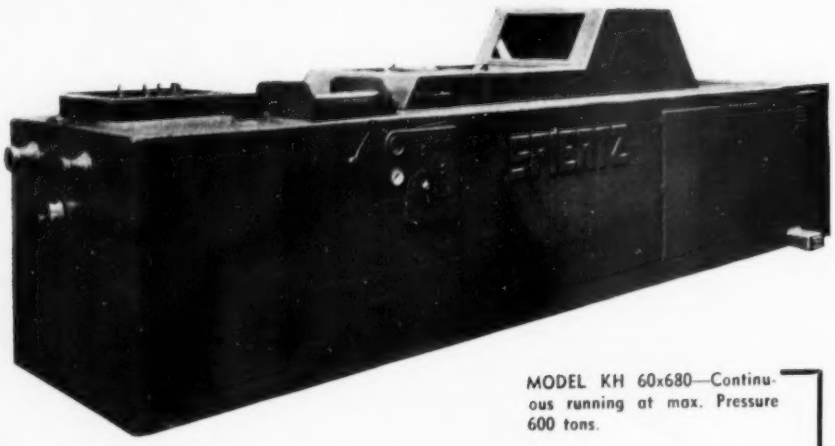

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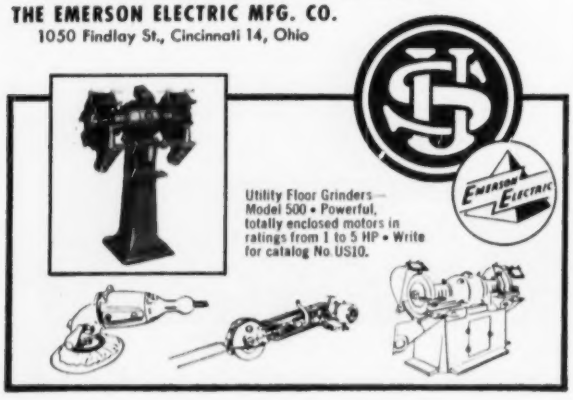
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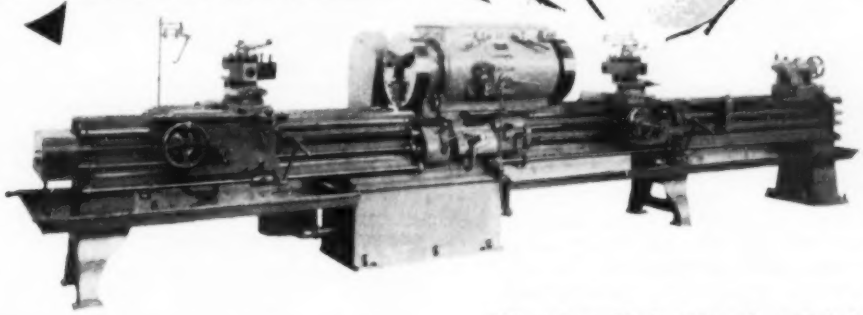

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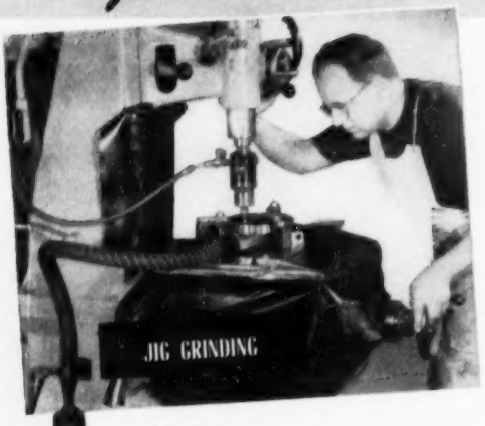

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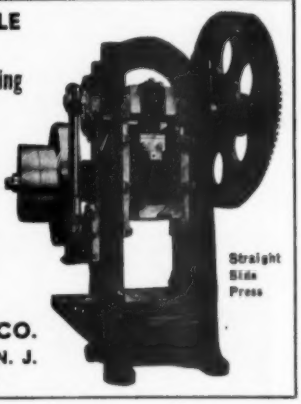

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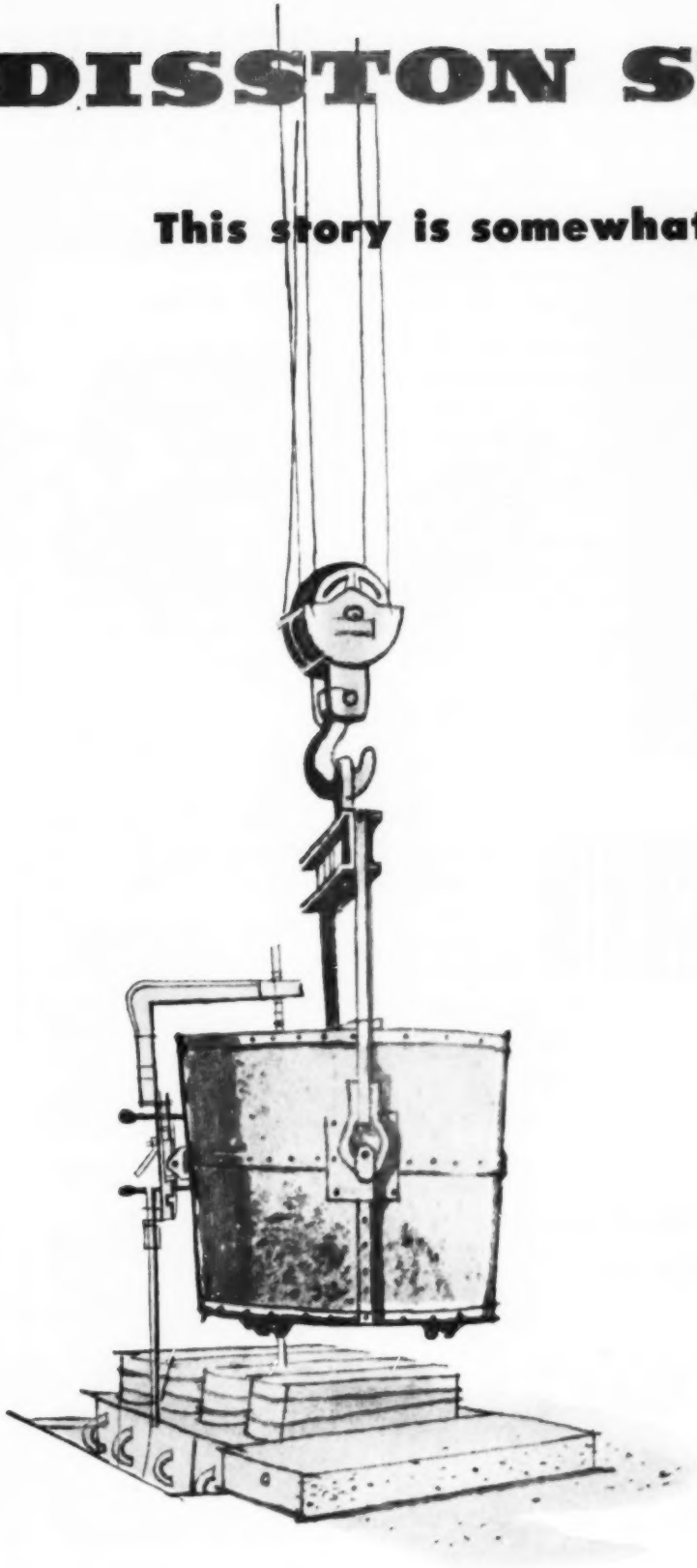

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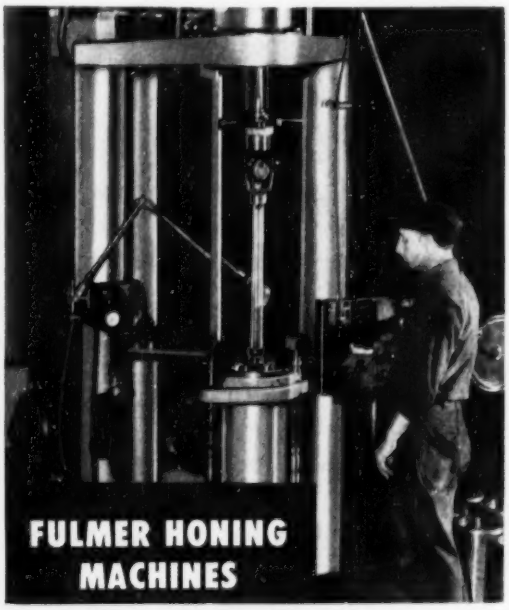

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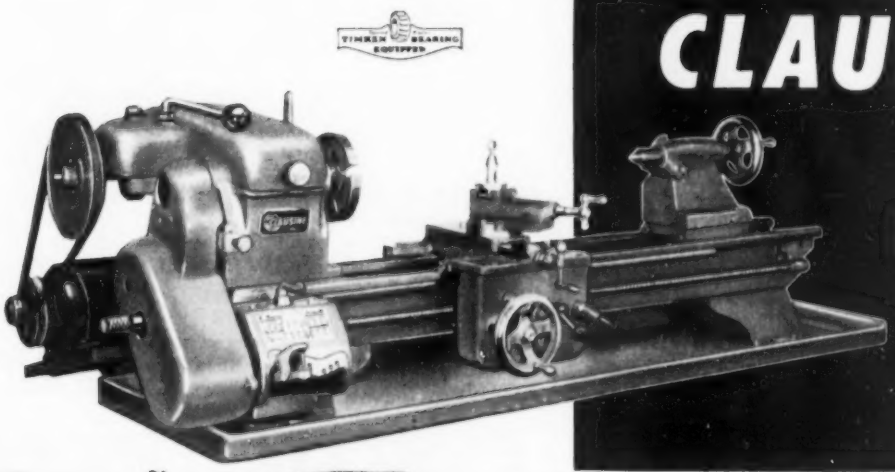

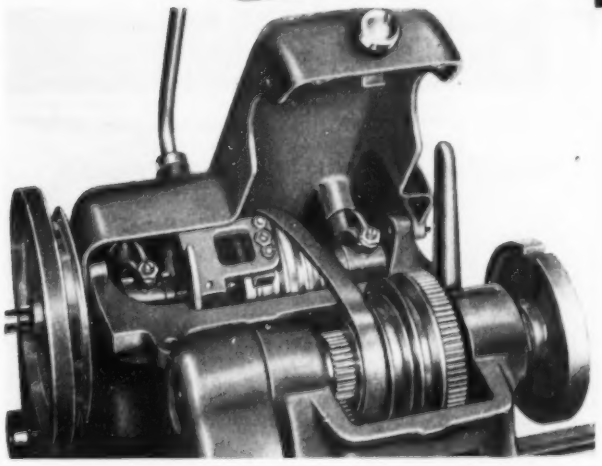

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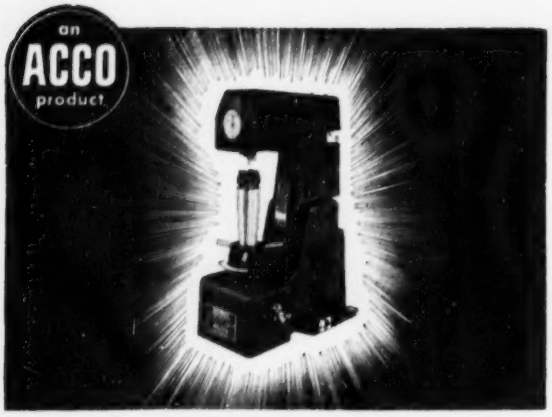

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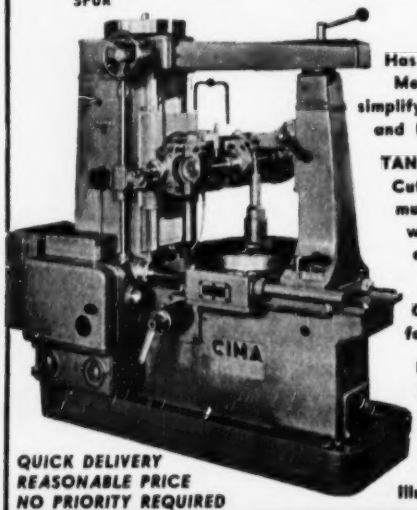

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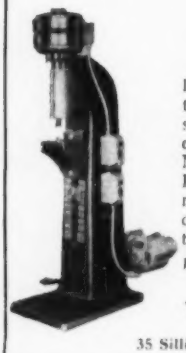

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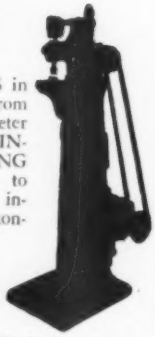

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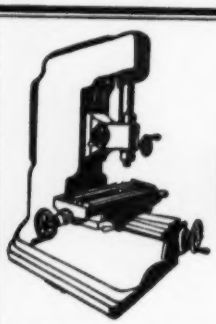

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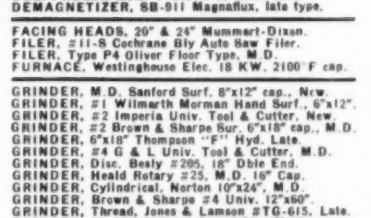
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hispeed, all sizes, M.D.

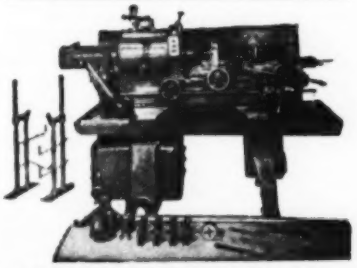


4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.D.D. Cold 3/16".
INDUCTION HEATER, 16 KVA Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lepel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW.
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head. Bar Feed, 4" capacity through spindle. Late Type, Motor Driven.

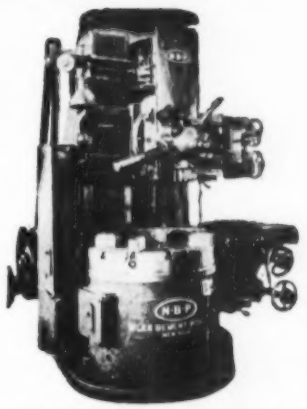


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Le-Swing 6"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type.
LATHE, LeBlond 14"x6', Q.C.G., M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x10' Axelson Grd., Late, M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late.
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Buffing Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½"
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cinci. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, 1 & 2 ton, Platform & Fork.

MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, 2M Cincinnati Univ. Horiz. M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #6Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cinci. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-8 Cinci. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd. Late Type. Vert. Hd.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, #2A Brown & Sharpe Horiz. Univ., M.D.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cinci. Vertical Hi Power, M.D.
MILL, #3C Becker Vert. Die Sinker, M.D.
MILL, 42"x96"x12' Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #136 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 18—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hanson-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1185.
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Chucking Thread Mill, Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mitts & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #184 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 36"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #2½ & #6 Toledo, OBI, Motor Driven.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 79 & 90 tons, New.
PRESS, 135 Ton Clearing Single Crank 8" Str., Late.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, Federal #2 O.B.I. Grd. 2" Stro.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 60 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #6B Whitney Deep Thr. 24" throat.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles Bement Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1⅝" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Eglo. End 24" Thr. 1" thru 1".
PUNCH, H & J #4, 48" thr., with Shear Blades.

RIVET SETTER, ⅝" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 18'x1⅛" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.
ROLLS, #2 Buffalo Forge Vert. Angle, Bending, New.

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Radiac "1" DeSanno.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #48 Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, 10"x10" Racine Hydraulic, Late Type, M.D.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cinci., B.G., Motor Driven, N.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type
SHEAR, #26 Buffalo Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model GT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER MACHINE, Type UK300M.
BRINELL TESTER, Type 03DR, Steel City.
WELDER, 500 amp. Westinghouse Flexers A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WELDER, 200 KVA Federal, Projection.
WIRE STITCHER, Morrison & Acme, M.D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

HEADLINERS

LATHES

14"x30" Lodge & Shipley Selec. Grd. Hd.
19"x48" ctrs LeBlond Grd. Hd., a.c., m.d., taper
20"x72" ctrs Lodge & Shipley Selec. Grd. Hd., a.c. m.d.
22"x74" ctrs Lodge & Shipley Selec. Grd. Hd., a.c. m.d., taper
24"x60" ctrs American Heavy Patt. Grd Hd., a.c. m.d., taper
36"x96" ctrs Schumacher & Boye Triple Grd., cone, taper
36"x120" ctrs American Grd. Hd., a.c. m.d., taper
36" (raised to 44") x 157" ctrs American 16-spd. Grd. Hd., a.c. m.d.

TURRET LATHES

No. 1-A Warner & Swasey, Timken, covered ways
No. 2 Acme Full Universal, Timken, hard ways
No. 601-DD Oster "Rapiduction"

MILLING MACHINES

No. 4 Cincinnati High Power Vertical, a.c. m.d.
No. 4 Cincinnati High Power Universal, a.c. m.d., div. hds.
No. 4-B Brown & Sharpe Heavy Plain
No. 36 Van Norman, new 1943

GRINDERS

10"x18" Norton Plain, a.c. m.d.
10"x24" Landis Plain Self-contained, a.c. m.d.
10"x48" Landis Type C Plain Hydraulic, late
No. 13 Brown & Sharpe Universal & Tool, late
No. 49-53" Besley Vert. Spindle Disc
No. 81 Heald Internal, chucking, Size-matic, Gage-matic

RADIAL DRILLS

5'-13" col. Dreses
7'-17" col. Dreses

GEAR MACHINERY

No. 3-26 Brown & Sharpe, a.c. m.d.
No. 5A Cincinnati 60"x16", a.c. m.d.
No. 12 Barber-Colman Hobbers
No. 18HM Gould & Eberhardt 2-spindle Hobber
No. 18H Gould & Eberhardt Hobber, a.c. m.d.
6", 11", 18" Gleason Bevel Gear Generators
No. 7 Fellows High Speed Shapers

PLANERS

42"x42"x14' Niles-Bement-Pond Heavy Patt., d.c. m.d.
42"x42"x16' Gray, arr. m.d.

MISCELLANEOUS

24" Bullard "New Era" VTL, side head, threading
12'x5⅝" Pyramid Type Rolls, a.c. m.d.
1¼" Cone 4-spindle Automatic, bar feed, a.c. m.d.
No. 77 Toledo 85-ton Open Back Press
36" Morton Draw-Cut Shaper
7"x7" Pecrless "Mechani-Cut" Saw, a.c. m.d.

Many other machines in stock. Send us your inquiries.

COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

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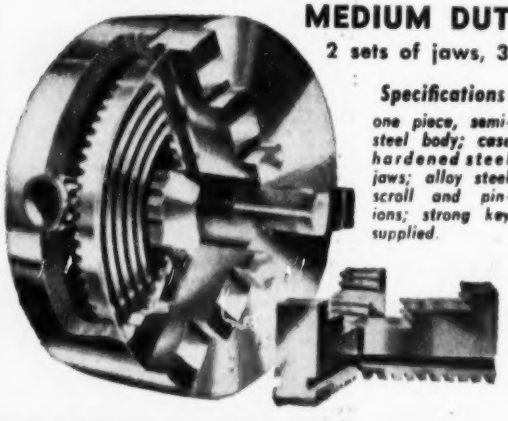
These lathe chucks, manufactured in England are equivalent in all respects to chucks selling here for two and three times the price. All are absolutely guaranteed with respect to accuracy, workmanship, and strength.



MEDIUM DUTY 3 JAW UNIVERSAL CHUCKS

2 sets of jaws, 3 pinions, for use with intermediate backplate.

Specifications *one piece, semi-steel body; case hardened steel jaws; alloy steel scroll and pinions; strong key supplied.*

Size	Weight	Price	Price Soft Jaws
2¾"	2½ lbs.	$ 25.00	$ 5.00
3¼"	3½	26.50	6.50
4"	6½	30.00	7.50
5"	12	37.50	9.00
6"	17½	45.00	10.00
7½"	29	57.50	13.50
9"	42	67.50	15.00
10½"	62	95.00	20.00
12"	88	125.00	22.50
15"	143	175.00	25.00
18"	200	250.00	35.00
24"	324	325.00	45.00

Steel body chucks are also available in some sizes.
Soft jaws and spare parts are immediately available from New York stock.

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1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SUNDSTRAND: 44" Double End Centering Machine

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
SUNDSTRAND: 44" Double End Centering Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspection Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain
LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT, 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

LAPPING MACHINES

FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
H.E.B.: High production hydraulic duplicating and copying lathes (new)
LODGE & SHIPLEY: #3A Duomatic. 25½" swing x 27" centers
POTTER & JOHNSTON: #6 DREL Automatic
New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY: 1A, 2A, 3A & 4A
WARNER & SWASEY #3, #4 & #5 Turret Lathes
HERBERT: #2, #4, #7, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

CINCINNATI Hydromatic Duplex, Rise-and-Fall, 34-36, Tracer Control
TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

THREAD MILLERS & TAPPERS

HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole.
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

WIRE FORMING MACHINES

BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

OPTICAL PROFILE GRINDER, Wickman, New
OPTICAL PROFILE GRINDER, Sheffield, used.
AUTOMATIC SCREW MACHINE, Swiss type, ⅜"—used
AUTOMATIC SCREW MACHINE, Wickman, Single Spindle, 7/16", New
CENTERING MACHINE: Sundstrand, 44" Double End.
CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
CUT-OFF: Russell 5½ & 9½" cut-off saws with auto. stock feed (new) hydraulic
TEST STAND: Denison 918-AM Hyd.
LATHES: Blount Polishing Speed Lathe, 12" dia. x 48" centers
HARDNESS TESTER: Gogar Brinell, Model 16-8
SHEFFIELD Precisionaire Gauge
WIRE FORMING MACHINES: 4-slides (new)

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immediate expansion is your problem; especially where DELIVERY and ECONOMY are important factors. Every one of our machines is unconditionally guaranteed and practically any machine can be inspected—under power.

BALANCERS

GISHOLT 12E Static, 1948.

BENDING ROLLS

SOUTHWARK 20'x1" Pyramid Type, Drop End, Balance Bar.

BORING MACHINES

HEALD #49 Double End Bore-Matic, 1942.
EXCELLO 1212 Double End, 1935.

DRILLS

Avey 6-Spindle No. 2MA6 Power Feed, No. 2 MT, 12" Overhang, 1943.
ALLEN No. 2 MS Single Spindle, No. 2 MT, Power Feed, 12" Overhang.

GEAR EQUIPMENT

BARBER-COLEMAN Model A Gear Hobber, 1943.
FELLOWS 61A Gear Shaper, 1941.
PRATT & WHITNEY 10" Hydraulic, 2 Wheel Gear Grinders (2), 1941.

GRINDERS, CYLINDRICAL

NORTON 10"x18" Type C Hydraulic, 1942.
BROWN & SHARPE No. 5 3"x18" Plain with Plunge Grinding, 1943.
BROWN & SHARPE No. 5 3"x12" Plain with Plunge Grinding, 1941.

GRINDERS, MISC.

NORTON 6"x18" Hydraulic Surface, 2 available, 1942 and 1943.
HEALD No. 72A3 Plain Cross Sliding Head, Riser Blocks, Cam Attach., 1941.
HEALD No. 25A 16" Rotary Surface, 1942.
HEALD No. 22 Rotary Surface, 12" Chuck, 1941.

LATHES, AUTOMATIC & PRODUCTION

POTTER & JOHNSON 5D Automatic Chucker with Air Chucking Equipment, 2 available, 1942.
LODGE & SHIPLEY 3A Duomatic, 1946.
SENECA FALLS Model R-14 Lo-Swing, 1942.
SENECA FALLS Model LR Lo-Swing, complete, 1942.

LATHES, ENGINE

NILES 30"x144" centers, Timesaver T.A. Chuck, 1941.

LATHES, TURRET

GISHOLT 1L Saddle Type Bar and Chuck, 1944.
GISHOLT No. 4 Ram type Universal. Bar feed, 1944.

MILLS

CINCINNATI 56-90 Plain Hydromatic.
KEARNEY & TRECKER 2K Vertical, 1943.
CINCINNATI 2-24 Rise and Fall, 1942.
CINCINNATI 1-18 Plain Automatic.
CLIMB Milling Auto. Spdle. Stop, 1941.
SUNDSTRAND No. 0 Rigidmill 18" table travel. Electronic close stop and dwell, 1943.
KEARNEY & TRECKER Model 1H—18" Manufacturing Mill, 1941.
U. S. MULTI-MILLER MM-1-5-2 Rise and Fall, 1943.
U. S. MULTI-MILLER MM-1-60, 1944.

MULT-AU-MATICS

BULLARD 12" 8-Spindle, Type D, with Power Chuck and Tooling, 1941.

. . . TELEPHONE MOnroe 6-7715 . . .

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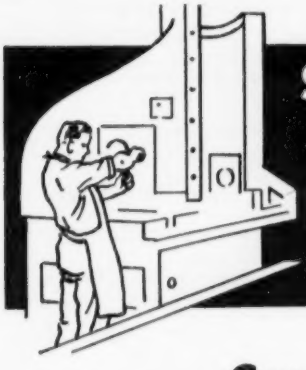

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MACHINERY FOR SALE

Brown and Sharpe Hobber, No. 44, serial No. 104 with Crocker Wheeler Motor, serial No. 748275. Equipped to cut spur and spiral gears and splines.

Schuchardt and Schutte Hobber, 36" CAP TP #2, serial No. 6706. Equipped with differential for cutting spur, spiral, and worm gears.

60" Reinecker Hobber, RF No. 4N, Serial No. 6937/1. Completely rebuilt. Equipped with Tangential feed and differential.

These hobbers now being used in production and in excellent condition. Can be seen in operation.

1—Monarch Lathe 12" and serial No. CK 3919.

1—Monarch Lathe 14", serial No. C-5239

All of the above equipment motorized, 220 volts AC, 3 phase.

FS-8480, AMERICAN MACHINIST
330 W. 42 St., New York 36, N. Y.

BROWN & SHARPE Automatics (several)
W.F.F. Double Action Power Presses
#08 CINN. Vert. with Rotary Table
J & L Turret Lathes, Steel Head
SHELL THREAD ROLLERS
30" ESPEN-LUCAS Hydraulic Cold Saw
1/4" MANVILLE #1 D.S.S.D. Header
3/16" MANVILLE #0 D.S.S.D. Header
#2A WARNER & SWASEY Turret Lathe
#0 W.F.F. Screw Slotters
SNOW & HASKINS Tappers

Numerous Other Machine Tools

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SAWS

No. 4X-B Robertson Economy Saw, m.d., new
No. 4B Robertson Economy Saw, m.d., new
Gustav Wagner Cold Saw, m.d.
7½ H.P. Cinti. Elec. Tool Co. Abrasive Cut-off Machine, type JCAW
Kalle Heavy Duty Steel & Metal Bandsaw, Model BSM-40, new
6x6" Racine Power Hack Saw, model 2C

RAILROAD MACHINERY

#2 Niles-Bement-Pond Double Head Axle Lathe, m.d.
90" Niles Balanced Quartering & Crank Pin Turning Machine, latest
90" Putnam Driving Wheel Lathe, m.d.
90" Niles Journal Lathe, including 2 inside journal turrets and 3½" spindle double quartering attachment, m.d.
90" Niles Driving Wheel Lathe, m.d., latest
Niles-Bement-Pond Quartering Machine, m.d., new

SHAPERS

No. 7A Douglas Vertical Shaper, m.d.
16" Hercules Shaper, m.d., new
24" American Back Geared Crank Shaper, m.d.
24" Potter & Johnston, cone
24" Gould & Eberhardt Back Geared Crank Shaper, m.d.
24" Walcott Back Geared Crank, 4 step cone
30" Morton Draw-Cut Shaper
32" Cincinnati H.D. Back Geared, cone, motorized
32" Morton Draw-Cut, m.d., late
32" Ohio Dreadnaught Extra Heavy, m.d.
32" Ohio Shaper, m.d., gear box
36" Morton Draw-Cut, m.d., late
36" Ohio Dreadnaught Extra Heavy, m.d.

SLOTTERS

10" Newton, m.d.
10" Newton, cone
12" Bement-Miles, m.d.
15" Canada, m.d.
18" Dill, m.d.
18" Betts Crank Slotter, m.d.
18" Niles-Bement, s.p.d.
20-24" Dill, m.d.
22" Betts, m.d.
48" Niles, m.d.

TAPPERS

Acme Semi-Automatic Nut Tapper, 6 spindle, 1½", arranged for m.d.
3 way Natco Tapper, 6 spindles, fixed center tapping head
No. 1, No. 2, No. 3 Haskins, pneumatic control
2 spindle Haskins, pneumatic control
No. 22 Murchey, 6 to 28 pitch
Baush Radial Drilling & Tapping Machine, m.d., latest
No. 3C Haskins, pneumatic control, type 3 CAM., m.d.

SHEET METAL MACHINERY

No. 1 Niles Pinch Type Bending Rolls, 5'2"x5/16" cap.
Doty Mfg. Co. 6' Pyramid Type Bending Rolls
No. 3 Ryerson Rotary Bevel Shear, 4" throat
Gray Turret Head Metal Cutter, cap. ¼", 36" throat
No. 2 Libert Nibbler, 28" throat
120" No. 100 Niagara Heavy Production Folder, 16 gauge, m.d.
No. 3—5/16" cap. Gray Sheet Metal Cutter, m.d.
8'x½" cap. No. 186 Dreis & Krump Leaf Brake, m.d.
No. 336 cap. ⅜" W. J. Savage Co. Nibbler
Pels Combination Ironworker, m.d.

TURRET LATHES AND SCREW MACHINES

No. 691 W. D. Oster Geared Head Rapiduction, m.d. in 16, chucking
No. 1 Warner & Swasey, bar, m.d.
No. 1A Warner & Swasey, m.d.
No. 1, 2 Cincinnati-Acme Full Universal, m.d.
No. 2A Warner & Swasey, m.d., bar
No. 2F Foster Fastermatic, m.d., Timken
No. 3 Cincinnati-Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d.
No. 3F Foster Fastermatic, m.d., Timken
No. 4 Warner & Swasey, cone, bar and chucking types
No. 4A Warner & Swasey Universal, m.d., chucking
No. 4FU Foster Fastermatic, m.d., latest
#5 Gisholt Full Universal Type Turret Lathe, m.d., late type
No. 7 Hardens & Oliver, cone
⅝" Pratt & Whitney Hand Screw Machine, cone, bar
2½x24", 3x36", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking types
18" Libby Type A, m.d., chucking
20" Acme, s.p.d., bar
20" Drosos, arranged for factory m.d.
26" Libby Type C, m.d., chucking
9/16" Gisholt, m.d.
Model 4-H-12 Libby, cross sliding turret, m.d.

AUTOMATICS

9/16" Acme, m.d.
⅞" Cleveland Model B, belt
1" Acme, m.d.
1½" Cleveland Model A, belt
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
14" Fay Flanders Type, m.d.
4 spindle 2¼" Cleveland Model "K", m.d.
No. 8A Cleveland, m.d., 8" cap., latest

BOLT THREADERS

Victor Nut Facing Machine, m.d., cap. ¾" to 2" nuts
1" Landis Double Spindle, m.d. thru gear box
1½" Landis #2 spindle, late
1½" Landis 2 spindle, older type

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK HORIZONTAL & VERTICAL BORING MILLS, BROACHES, RADIAL DRILLS, BALL BEARING DRILLS, HORIZONTAL DRILLS, MULTIPLE SPINDLE DRILLS, UPRIGHT DRILLS, GEAR MACHINERY, GRINDERS, HAMMERS, HONING MACHINES, ENGINE LATHES, MFG. LATHES, MILLING MACHINES, PLANERS, PRESSES, ETC.

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LATHES

No. 8 SUNDSTRAND stub, 1941
No. 12 GISHOLT automatic
10" EE MONARCH, 1943
14x30 MONARCH, 1936
14x30 LE BLOND, 1940
14x54 MONARCH, 1937
16x54 REED PRENTICE, 1941
16x102" REED PRENTICE, 1941
18x48 MONARCH, Ser. #16073, 1942
22x72 LEHMAN, 1940, H.D.
25x48 LEBLOND, 1941

10' x 10' x 25' SELLERS Planer

TURRET LATHES

No. 2 BARDONS & OLIVER, Elec., BF
No. 2 WARNER & SWASEY, 1939, Ser. #48127
No. 3 BARDONS & OLIVER, BF, Tooling
No. 5 GISHOLT, 1941, Chucker
No. H-5 LIBBY, 1940
No. 1L GISHOLT, Cross Slide Turret, Power Chuck, 1940
No. 1A WARNER & SWASEY Pre., 1943, BF & CH
No. 3R GISHOLT, 1942
No. 3L GISHOLT Taper Attach. BF, Cross Slide Turret 1936
4A WARNER & SWASEY 12 Hole Cross Sl. Turret Lead Screw, Power Chuck, 1941

BORING MILLS

No. 30 GIDDINGS & LEWIS 3" Hor. w/2 Aux., Ser. 4805
24" BULLARD Vert., 1940, Ser. #16817
42" GISHOLT
52" NILES BEMENT POND
58" BULLARD
62" NILES
84" NILES BEMENT POND

MILLS

No. 2 BROWN & SHARPE, Univ., 1941
No. 2 CINCINNATI, Vert. HSDT, 1943
No. 08 CINCINNATI Vert., Rotary Table
No. 1-12 CINCINNATI
No. 3VG REED PRENTICE (2)
No. 2 HL KEARNEY & TRECKER, Plain
24"x36" INGERSOLL Duplex, 1942
No. 3-36 CINCINNATI Production
No. 4-48 CINCINNATI Production
No. 12 BROWN & SHARPE Production

GRINDERS

No. 1½ LANDIS Chaser Grinder
No. 22 HEALD Rotary Surf., 1942
No. 226 GARDNER, Disc, 1948, Excel.
10x48 NORTON Surf., 1940
TG615 JONES & LAMSON Thread
6x18 Cyl. LANDIS, Plunge Cut, 1943
6x30 CINCINNATI, Plunge Cut, 1943
10x36 NORTON Angular Head. Ser. #16604
10x72 LANDIS, Cyl. Plunge, 1940
14x48" LANDIS, Type D, Hyd. Plunge 1941, #21660
Mod. 72A-5 HEALD Int. Surf., #15279, Cr-St. Head
No. 24-36 BRYANT

GEAR MACHINERY

BARBER COLMAN HRS Hob Sharpener (2)
No. 12 GLEASON Rougher (2) #19787 & #215790
Mod. 7125A FELLOWS Shaper, Ser. #19713
Mod. Z FELLOWS Shaper, 1943
12" GLEASON Spiral Cutter Sharpener, Ser. #10444

SCREW MACHINERY

1¼" CONEMATIC, 6 Spdl., 1940
1½" CONEMATIC, 6 Spdl., (2)—1940
1⅞" CONE, 8 Spdl., 1942
2" GREENLEE 6 Spdl., 1940
3½" CONEMATIC, 4 Spdl.
Mod. B 2½" CLEVELAND, Late, 1941
Mod. A 3½" CLEVELAND, Late, 1942
5" CONEMATIC, 5 Spdl.
7½" GOSS & DE LEEUW, 6 Spdl. Aut. Chucker; Work Rotating, 1943
No. 0 INDEX (4)

DRILLS

No. 510 OLIVER Drill Pointer
3'7" CANEDY OTTO Radial, Used
8'19" CINCINNATI BICKFORD Radial 1941
No. 2½ ALLEN MS, PF, #3MT
No. 20½ BARNES, 1948
No. 121 BAKER
No. 321 BAKER
Mod. 242 BARNES #5MT
Mod. H-3 BARNES, Hydram, 1941
6 Spdl. EDLUND, HF, #2MT

MISCELLANOUS

⅝"x30' BERTSCH Bending Rolls, Pyr. Power Adj. to rolls; like new
BUFFALO Angle & Bar Shear 15" I-Beams 8"x8"x 1¼" Angle 4" sq. cap. 1944
No. 6 MITTS & MERRILL Keyseater
DO-ALL ML Saw & Filer
DO-ALL V-26 Saw—DO-ALL V-26 Saw

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LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 656 New Britain Chucker, 1943.
1½" 6 Spdl. Cone Automatic, 1941.
2" Model A Cleveland, 1941.
1-1/16" Model A Cleveland, 1943.
No. 00G Brown & Sharpe, 1941.

BROACHES

HP-100 La Pointe Horiz. Broach, 1945.

DRILLS

3'-11" Archdale Radial, 1947.
Ma-6 Avey 4 Spindle, H.F. 1943.
Allen Single Spindle Drill & Tapper, 1942.
No. 2 LMS Leland-Gifford H.F. 1942.

GEAR EQUIPMENT

No 3 Barber Coleman Hobber, 1940
No. 7 Gleason "Revex" Rougher, 1943.
No. 6 Gleason Revacycle Generator, 1940.
No. 72 Fellows H.S. Gear Shaper, 1942.
10" Pratt & Whitney Hyd. Gear Grinder, '42
SG-11 Georgrind Spline Grinder, 1942.

GRINDERS, CYLINDRICAL

10"x18" Norton Plain Type "C", 1940.
6"x30" No. 12 B & S Hydraulic, 1940.
No. 2 Cincinnati Centerless Grinder, 1944.

GRINDERS, INTERNAL

No. 72-A3 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943.
No. 16A2B Bryant Hole & Face, 1942.
No. 16 CP 16 Bryant Hydraulic, 1942.
No. 172 Heald Hydraulic Gap, 1940.

GRINDERS MISCELLANEOUS

No 24D Hanchett Duplex Rotary 1945
No. 18A Blanchard Auto. Surface, 1942.
Cincinnati Centerless Lapper, 1942.
HRS Barber-Colman, 1942.
#35 Excello Precision Thread, 1942.
No 7 Grand Rapids Universal 1942

GUN BARREL MACHINES

No. ½ B x 30 P & W Reamer, Latest.
No. ½ B x 30 P & W Reamer, Latest.
No. ½ B x 50 P & W Rifler, Latest.

LATHES, ENGINE

27"x192" Niles Timesaver, 2 Carr, 1941.
27"x96" Niles Timesaver, 1940.
26"x180" Betts Bridgeford, 1940.
26"x96" Betts Bridgeford, 1940.

LATHES, PRODUCTION

8"x84" Lo-Swing Semi-automatic, 1941
No. 3A Lodge & Shipley Duomatic, 1942
No. 1FU Foster Fastermatic, 1942

LATHES, TURRET

36" Bullard VTL, Spiral, Late.
No. 2A Warner & Swasey Saddle Type, 1940.
No. 1A Warner & Swasey Saddle Type, 1941.
No. 1L Gisholt Saddle Type, Late.
No. 3R Gisholt Universal Saddle Type, 1943.
No. H5 Libby Universal Saddle Type, 1939.
No. 5 GISHOLT Universal Ram Type, 1942.

MILLS, PRODUCTION

No. 1848 Milwaukee Duplex, 1942.
No. 2-18 Cincinnati Automatic, 1942.
M-18 Milwaukee, 1943.
No. 3 Cincinnati Univ. Dial Type.
No. 08 CINCINNATI Rise and Fall, 1942.

MILLS, TOOL ROOM

No. 3 Van Norman Plain, 1942.
No. 22L Van Norman Plain, 1943.
No. 2 Saimp Vertical New.
No. 2 Saimp Universal, New.
No. 3 Saimp Plain & Vertical, New.
No. 4 Saimp Vertical, New.

SHAPERS

32" Ohio Heavy Duty Univ. 1951.
16" Gernetti Universal Shaper, New.
20" Gernetti Universal Shaper, New.
24" Gernetti Universal Shaper, New.

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*

1961 S. Meridian St. • • Indianapolis, Indiana

#26 VAN NORMAN Universal Miller
#2 CINCINNATI HS Dial Type Plain Millers
3'11" DRESES Radial Drill—Motor on Arm
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder—1942
Nos. 4D and 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A & 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathe
No. 5 CINCINNATI Plain High Power Miller.
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P & W Model C Thread Miller
No. 64 FELLOWS Gear Shaper
No. 72 FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
16/20" GOULD & EBERHARDT Industrial Shaper
100" BETTS Vertical Boring Mill, 2 heads

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Kan & Roach 15 stand, 30" wide, 4½" dia. shaft 75 H.P. M.D.
Yoder 14" stand, 24" wide, 2½" dia. shaft, 25 H.P. M.D.
Tishkin M-2 Ton stand Yoder with AC-2 Cutoff.
Rafter Tube Forming Machines, 5 & 7 Stand.
Yoder 5 stand vertical, with AC-1 Cutoff.

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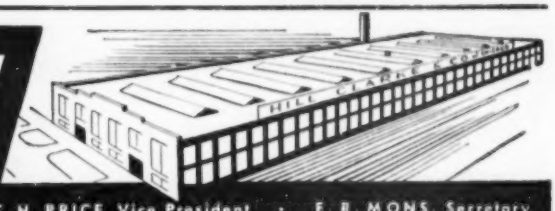

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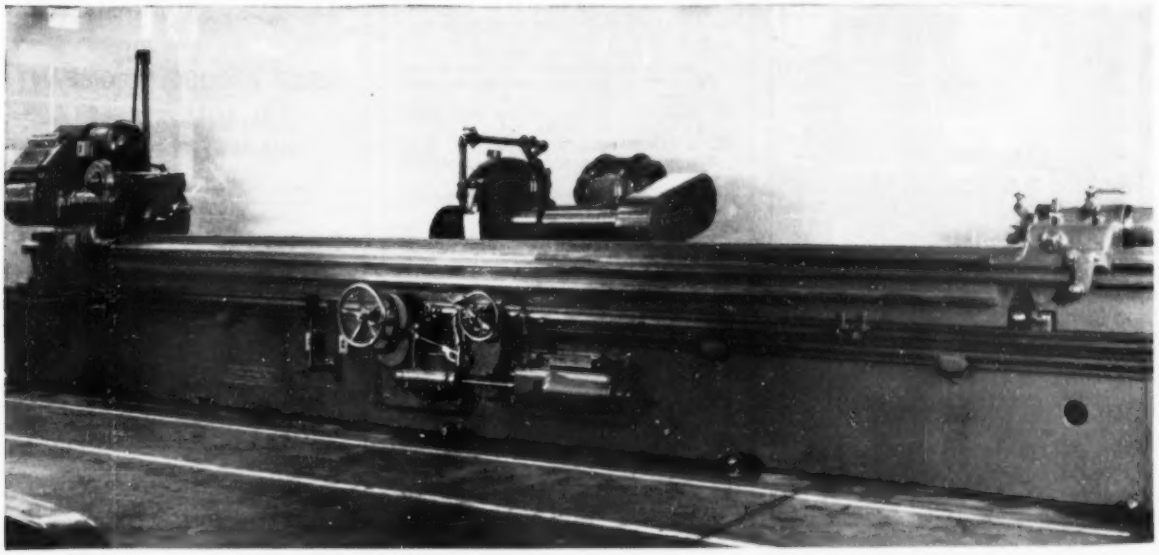

NORTON CYLINDRICAL GRINDER 24" Swing x 264" (22 feet) between centers

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—14" Sw—No. 2 Avey Cam Fd.
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl—24/ Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl. Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 36" Norton Type C
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
10"x36" centers
10"x72" centers
18"x96" centers
24x32 Gap x 144" centers
14"x36" centers 14"x72" centers
14"x96" centers 18"x96" centers
20"x96" centers
24"x264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951)
(9" swing—1" bore x 3¼" grind stroke)
No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.
No. 16 F-28 Bryant Internal Grd.

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No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

BORING MACHINES

No. 45—4½" Giddings & Lewis Hor. Bar
100" Niles-B-Pond Vert. Bar

LATHES

16"x33" R-14 Seneca Falls Auto. Lathe
18"x6' American Geared Head Lathe
19"x8' LeBlond Hvy. Duty Lathe
27"x12' American Geared Hd. Lathe
27"x12' centers LeBlond Lathe
36"x18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7⅛" Hole—Spdl.

MILLING MACHINES

No. 08 Cincinnati Vert. Mill (1942)
54"x30"x16' Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
10"x60" Pratt & Whitney Thrd. Mill
12"x102" Lees-Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
60"x48"x27' American, 4 hds.

MISCELLANEOUS

1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1948)
No. 0 Bakewell Tapper

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AUTOMATIC SCREW MACHINES

ACME GRIDLEY 9/16" cap. 6 spindle; late.
ACME GRIDLEY 1⅝" cap. late.
CLEVELAND 3¼" model "A" single spindle; late.
GYROMATIC "Tavannes" #40 6-spindle; late.

GEAR CUTTING EQUIPMENT

BROWN & SHARPE #6-72" Auto. Cutter; M.D.
CROSS #1, 40, 45 Gear Tooth Rounder; M.D.
FELLOWS #6IA, 6Z2, 7S, 7A, 77, 48 H.S. Gear Shapers; late.
FELLOWS 13LS Lapper, motor drive; late.
GLEASON 3" and 12" Straight Bevel Gen.; late.
GLEASON 3" spiral bevel gear gen.; M.D.
GLEASON 25" Straight bevel gear Generator; M.D.
GLEASON 24", 37" Bevel gear planers; M.D.
GLEASON #6 'Revacycle' late type.
GLEASON #13 Hypoid cutter sharpener; late.
GLEASON #14 Spiral bevel Hypoid gear grinder; late.
GOULD & EBERHARDT 12H Gear Hobber; late.
GOULD & EBERHARDT 18H Gear Hobber; M.D.
GOULD & EBERHARDT #36BM 3-spindle auto. gear rougher; M.D.
DETROIT type GG-35 Gear Grinder; late.
MICHIGAN Model 854 gear shaver, rack type; M.D.
MICHIGAN Gear Finisher, M.D., 862-24-A; late.
PRATT & WHITNEY 10" Gear Grinder; late.

LATHES, TURRET

WARNER & SWASEY 2A Univ. Preselector head; late.
GISHOLT 2L High Production, Timken, M.D., late.
GISHOLT 1L Univ. saddle type, Timken, M.D., late.
MOREY #2 ram type, Timken, late.

LATHES, ENGINE & MFG.

MONARCH 12"x30" centers, Model CKK, late.
NILES 27"x96" centers, Time Saver, Timken; late.
MICHIGAN Model 1712 Univ. Relieving mach.; 12"x32" centers; late.
U.S. model 8ICB Cutter Reliever, 8" cap; late
DENHAM 16"x48" centers, Gap; late type.
DENHAM 12"x34" centers, Gap; late type.
DENHAM 16"x72" centers, Gap; late type.
HENDEY 14"x30" centers, M.D., late type.
JONES & LAMSON "Fay" 20"x25" auto; M.D., late.
LANG 12"x42" grd hd Gpa; motor-in-base
LEHMANN 25"x96" ctrs., Timken; grd. M.D.
LeBLOND Mod. 7ACL Crankshaft; M.D.
LODGE & SHIPLEY 14"x30" centers, late type.
LODGE & SHIPLEY No. 5-24" and 96" centers; DUOMATIC; Timken; late.
LoSWING 4x60", 4x84", 8x60", 8x108"; late.
MONARCH 14"x42" centers "Z" Magnamatic, auto. Timken; M.D. late.
NILES 30"x46" Boring; "Time Saver"; late type.
PORTER-McLEOD 16"x6'; 16"x8'; NEW.
SPRINGFIELD 14"x43" geared; M.D.
SWIFT 16"x72" centers; late type.

PLANERS

BETTS (Consolidated) 103"x84"x44"; 4 hds; PRT; box table; M.D.
DETRICK & HARVEY 48"x48"x16', 4 hds hydr. M.D.
GRAY 24"x24"x6'; motor drive.
GRAY 36"x36"x10' double housing "Maximum service," M.D.
LIBERTY 144"x76"x48' adj. variable openside, box table, 4 hds, PRT, M.D.
NILES 48"x48"x12' "Time Saver", 3 hds, late.
NILES 108"x84"x42' 4 hds, rapid traverse, box table, DC, M.D.
N.B.P. 60"x60"x12'; 3 hds, PRT, M.D.
N.S.P. 72"x72"x30'; 4 hds; P.R.T. M.D.
NILES 48"x48"x10' double 4 hds; PRT; M.D.

PRESSES

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N.B.P. 48" Horiz. wheel press hydr. M.D.
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Milwaukee 2H Universal
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Head
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Cincinnati #3, #4 hi-power, 08 Vertical
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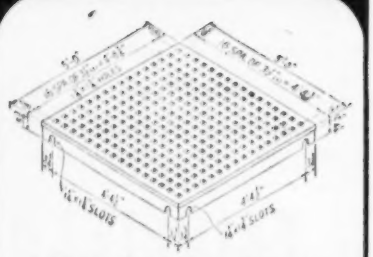

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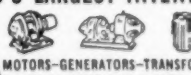

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INDEX OF PRODUCTS ADVERTISED IN THIS ISSUE

Abrasives, Coated 30-31, 70, 76-77, 182, 188-189, 204

Accessories & Attachments (Machine Tool) 8-9, Insert Bet. 32 & 33, 45, 71, 78-79, 86-87, 205, 220, 222, 234, 236

Arbors & Mandrels 193

Balancing Machines 56, 222

Bearings 4th Cover, 54-55, 226

Blast Cleaning Equipment & Supplies 70

Boring, Drilling & Milling Machines (Horizontal) 3rd Cover, 14-15, 34-35, 37, 209

Boring Machines Internal 2nd Cover

Boring & Turning Machines (Vertical) 37, Insert Bet. 48 & 49, 88, 258, 263

Broaching Machines 191, 207

Brushes 40

Cams 232, 242

Castings 196

Centrifugal Machines 226

Chucks 242, 259

Collets 259

Controls, Electrical 39, 175

Cut-Off Machines 216, 243

Diamond Wheels 261

Disintegraters, Metal 146, 243

Dressers 8-9, 86-87

Drilling Machines 26-27, 44, 49, 58-59, 62-63, 80, 83, 98, 101, 173, 197, 211

Duplicators & Pantographs 78-79, 167

Engineering & Production Services 69

Fabricating Methods & Services 220, 227

Fasteners 56B, 202, 224-225, 231, 258

Floor Drying Compounds 130

Gages & Instruments 16, Insert Bet. 32 & 33, 47, 203, 212, 222, 226, 235, 236, 238, 242, 261

Gear Cutting Machines 3, 6-7, 207, 232, 242

Gears, Speed Reducers, Motor Reducers 181, 195, 208, 232

Gear Testers 3, 6-7

Grinders, Cutter & Tool 82, 230, 262, 264

Grinding Machines, Production 12-13, 18-19, 29, 42, 57 84, 102, 213, 217, 236, 238, 262, 264

Grinding Wheels 29, 30-31, 76-77

Heads: Drilling, Grinding & Tapping 71, 226, 258

Heat Treating Equipment & Supplies 28, 48, 259

Hydraulic & Pneumatic Parts & Equipment 177, 211

Jig Borers 209, 260

Lapping Machines 18-19

Lathes, Automatic 33, 56

Lathes, Engine 32, 33, 34-35, 38, 66, 72-73, 78-79, 81, 167, Insert Bet. 168 & 169, 179, 183, 198, 202, 229, 237

Lathes, Turret 22-23, 56, 64

Lubricants, Cutting Fluids, Quenching Oils & Solvents 75, 150, 221

Machines, Super Finishing 56

Marking Machines, Tools & Supplies 238

Materials, Cutting & Forming 41, 65, 96-97, 152, 169, 185, 208, 219, 227, 233, 239

Materials of Manufacture 46, 65, 171, 201, 228, 240

Mechanical Parts & Equipment 205

Millers, Die Sinkers, Profilers 4-5, 20-21, 43, 69, 200, 243, 263

Motors, Electrical 39, Insert Facing 56, 61, 218

Oil Purifiers 226

Planers 94

Presses, Forging & Forming Equipment & Supplies 36, 50-51, 184, 194, 214, 216, 220, 223, 226, 233, 238, 241, 242

Production, Inventory & Tool Control 192

Pumps, Circulating 206

Riveting Machines 242

Safety & Welfare Equipment 263

Saw Blades 222

Sawing Machines 234

Scrap Handling Equipment & Supplies 210

Screw Machines; Chucking Machines 17, 74, 190

Shafting, Flexible 186-187

Shapers, Slotters, Keyseaters **104, 206,** 222, 238

Special Machine Tools **69, 90,** 145

Stampings 240

Tapping Attachments 148, 186-187

Tapping Machines 62-63, 80, 197, 211

Thread Cutting Machines 10-11, 60

Tools, Cutting 24-25, 46, 52-53, 67, 68, 85, 96-97, 178, 186-187, 200, 205, 220, 227, 260, 262

Tools, Hand 199

Tools, Measuring 234

Tools, Portable 58-59, 186-187, 213, 215, 236

Used & Surplus Equipment 246-256

Vises 86-87, 234

Welding & Cutting, Brazing & Soldering Equipment & Supplies 202

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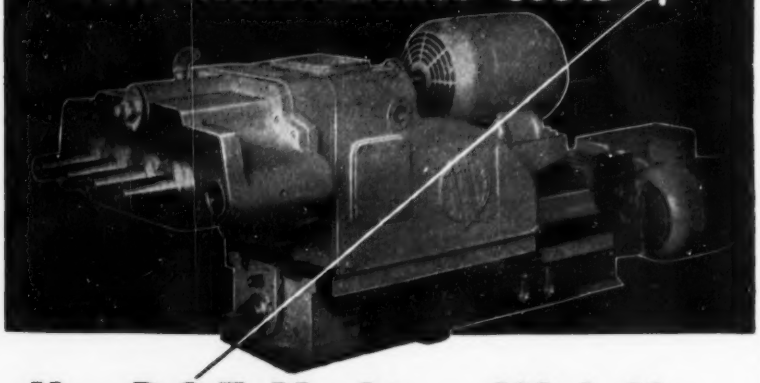

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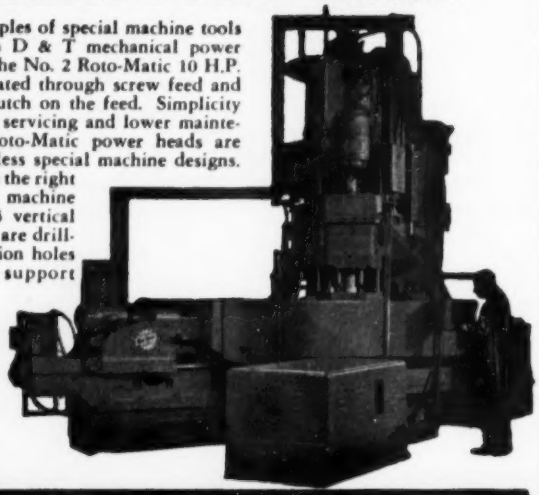

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INDEX TO ADVERTISERS

This index is published as a convenience to the readers. Every care is taken to make it accurate, but AMERICAN MACHINIST assumes no responsibility for errors or omissions.

	Page
Abrasive Products Inc.	204
Acme Gear Co.	232
Acromark Co.	238
Affiliated Machine & Tool Co.	263
Allegheny Ludlum Steel Corp.	233
Allied Products Corp. Richard Bros. Div.	227
Allis-Chalmers Mfg. Co.	61
American Brass Co.	201
American Chain & Cable Co. Inc.	242
American Pulverizer Co.	210
American Steel Foundries, King Machine Tool Div.	88
American Tool Works	101
Ames Co., B. C.	212
Armour & Co. & Subsidiaries	182
Armstrong-Blum Mfg. Co.	243
Armstrong Bros. Tool Co.	45
Atlantic Gear Works Inc.	232
Atlas Press Co. Clausing Div.	241
Austin Industrial Corp. Sub. of Nichols-Morris Corp	43
Avey Drilling Machine Co.	98
Axelson Mfg. Co.	229
Baker Bros., Inc.	44
Ball & Roller Bearing Co.	226
Barrett Co., Leon J.	226
Bay State Abrasive Products Co.	188-189
Bay State Tap & Die Co.	178
Belgian Electric Sales Corp.	218
Bethlehem Steel Co.	169
Bilgram Gear & Machine Co.	232
Black & Decker Mfg. Co.	213
Blair Tool & Machine Co.	232
Blake Co., Edward	230
Blanchard Machine Co.	42
Boye & Emmes Machine Tool Co.	198
Brown & Sharpe Mfg. Co.	Insert bet. 32 and 33
Brush Electronics Co.	203
Bryant Machinery & Engineering Co.	57
Buffalo Forge Co.	223
Bullard Co.	Insert bet. 48 and 49
Carboloy Dept. of General Electric Co.	96-97
Carborundum Co.	76-77

INDEX TO ADVERTISERS

	Page
Carroll & Jamieson Machine Tool Co.	202
Castle & Co., A. M.	185
Champion Rivet Co.	202
Chase Brass & Copper Co., Inc.	228
Cincinnati-Bickford Tool Co.	83
Cincinnati Gear Co.	208
Cincinnati Lathe & Tool Co.	Insert bet. 168 and 169
Cincinnati Milling Machine Co.	4-5
Cincinnati Milling Products Div. Cincinnati Milling Machine Co.	75
Cincinnati Planer Co.	14-15
Cincinnati Shaper Co.	104
Cleveland Automatic Machine Co.	74
Clinton Machine Co.	146
Columbia Tool Steel Co.	208
Columbus Die-Tool & Machine Co.	220
Cone Automatic Machine Co.	17
Consolidated Machine Tool Corp.	37
Crucible Steel Co. of America	219
Davis & Thompson Co.	258
Davis Keyseater Co.	238
Dayton Rogers Mfg. Co.	240
Delta Power Tool Division Rockwell Mfg. Co.	58-59
DeVlieg Machine Co.	209
Disston & Sons Inc., Henry	239
Eastern Machine Screw Corp.	226
Eisler Engineering Co. Inc.	242
Elastic-Stop Nut Corp.	231
Elox Corporation of Michigan	243
Ex-cell-O Corporation	90
Federal Machine & Welder Co.	214
Federal Press Co.	194
Fellows Gear Shaper Co.	6-7
Felters Co.	180
Ferracute Machine Co.	242
Fosdick Machine Tool Co.	26-27
Frauenthal Div. Kaydon Engineering Corp.	217
Fulmer Co., C. Allen	240
Gallmeyer & Livingston Co.	264
Gardner Machine Co.	29
General Electric Apparatus Dept.	Insert facing 56

(Continued on page 260)

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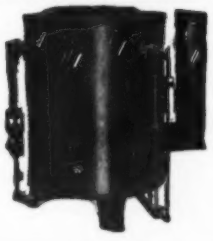

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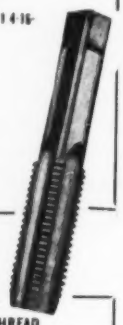
6	30-40-48-56-64
7	32-48
8	24-30-36-38-40-44-48
9	24-28-32-40
10	28-30-36-40-48-64
12	20-28-32-36
14	20-24-28
1/16	60-64
5/64	72
3/32	48
7/64	48-56
1/8	32-40
5/32	32-36-40
9/64	36-40
11/64	36
3/16	20-24-32
13/64	32
7/32	24-28-32
1/4	18-24-26-27-30-32-36-40
5/16	16-20-22-27-28-32-40

SIZE	THREAD
3/8	12-16-18-20-27-28-32-36-40-48
7/16	12-16-18-22-24-27-28-30-32-36-40
1/2	12-14-16-18-22-24-26-27-28-30-32-40
9/16	16-20-24-27-28-30-32-40-48
5/8	12-14-16-20-24-27-28-32-36-40
11/16	11-16-18-20-24-27-28-30-32
3/4	9-11-12-14-18-20-24-26-27-28-32
13/16	10-14-18-28-32
7/8	10-12-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-32
1	10-12-16-18-20-24-27-32-40
1-1/16	12-14-16-18-20-24
1-1/8	8-10-14-16-18-20-24-32
1-3/16	8-10-12-14-16-18-20-24
1-1/4	8-10-14-16-18-20-24-32
1-5/16	12-14-16-18-20-24-32
1 3/8	8-10-14-16-18-20-24
1-7/16	8-10-12-16-18-20-24
1-1/2	8-10-14-16-18-20-24-28
1-9/16	18-20-24
1-5/8	5-1/2 - 8-10-12-13-16-18-20-24
1-11/16	10-12-14-16-18-20-24

SIZE	THREAD
1-3/4	8-10-12-14-16-18-20-24
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20-24
1-15/16	8-10-12-14-16-18-20-24-28
2	4-1/2-8-10-12-16-18-20
2-1/16	12-14
2-1/8	12-16-20
2-3/16	12-16
2-1/4	4-1/2 - 8-12-1 4-16-
2-5/16	12-18
2-3/8	12-16-18
2-1/2	8-10-12
2-9/16	18
2-5/8	12-16-20
2-3/4	16
2-7/8	8-12-16
3	8-16
3-1/4	8-12-16
3-1/2	8-12-16
3-1/8	8
4	8-12



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0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11-16 24
3/4	10-16-18-28
13/16	16
7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	6-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	6-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1 11/16	8-10-12-14-16-18-20
1-3/4	8-10-12-14-16-18-20
1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
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INDEX TO ADVERTISERS

(Continued from page 259)

	Page
Giddings & Lewis Machine Tool Co.	14-15
Gisholt Machine Co.	56
Gleason Works	3
Gorham Tool Co.	85
Goss & de Leeuw Machine Co.	190
Grant Mfg. & Machine Co.	242
Gray Co., G. A.	94
Grob Brothers	234
Hangstefer's Laboratories, Inc.	240
Harco Engineering	222
Hardinge Brothers Inc.	38
Hartford Special Machinery Co.	197
Haynes Stellite Co.	46
Heald Machine Co.	2nd Cover
Heller Brothers Co.	199
Heller Machine Co.	49
Hisey-Wolf Machine Co.	262
Honan-Crane Corp.	221
Hones, Inc., Charles A	259
J & L Machinery & Supply Co.	226
J & S Tool Co.	86-87
Jarvis Co., Charles L.	186-187
Jones & Lamson Machine Co.	64, 71
K D K Products	236
Kearney & Trecker Corp.	20-21, 69
Kempsmith Machine Co.	193
King, Andrew	226
King Machine Tool Div. American Steel Foundries	88
Kingsbury Machine Tool Corp.	62-63
Knight Machinery Co., W. B.	263
L-W Chuck Co.	234
Landis Machine Co.	10-11
Landis Tool Co.	12-13
LaPointe Machine Tool Co.	191
LeBlond Machine Tool Co., R. K.	72-73
Lees-Bradner Co.	60
Lehigh Foundries Inc.	78-79
Lehmann Machine Co.	237
Leland-Gifford Co.	173
Lindberg Engineering Co.	48
Link-Belt Co.	54-55

INDEX TO ADVERTISERS

	Page
Linley Brothers Co.	260
Lodge & Shipley Co.	66
Logan Engineering Co., (Lathe Div.)	179
Logansport Machine Co.	177
Lucas Machine Division New Britain Machine Co.	3rd Cover
Luers, J. Milton	222
M.B.I. Export & Import Ltd.	183, 259
McCaskey Register Co.	192
Mead Specialties Co.	211
Metalmaster Div. Clinton Machine Co.	146
Micromatic Hone Corp.	92
Mitts & Merrill	222
Monarch Machine Tool Co.	33
Morris Machine Tool Co.	80
Morse Twist Drill & Machine Co.	24-25
Motch & Merryweather Machinery Co.	145
National Broach & Machine Co.	207
National Machine Tool Co.	206
National Malleable & Steel Castings Co.	196
National Tool Co.	67
National Twist Drill & Tool Co.	53
Nebel Machine Tool Co.	81
New Britain Machine Co.	3rd Cover
Niagara Machine & Tool Works	50-51
Norton Company	18-19, 30-31, 70
O.K. Tool Co.	200
Ohio Knife Co.	216
Oliver Instrument Co.	82
O'Neil-Irwin Mfg. Co.	184
Osborn Mfg. Co.	40
Ottemiller Co., Wm. H.	258
Parker-Kalon Corp.	224-225
Perfex Gage & Tool Co.	261
Philadelphia Gear Works	181
Reid Brothers Co. Inc.	34
Republic Steel Corp.	41
Revere Copper & Brass Inc.	171
Rotor Tool Co.	215

(Continued on page 262)

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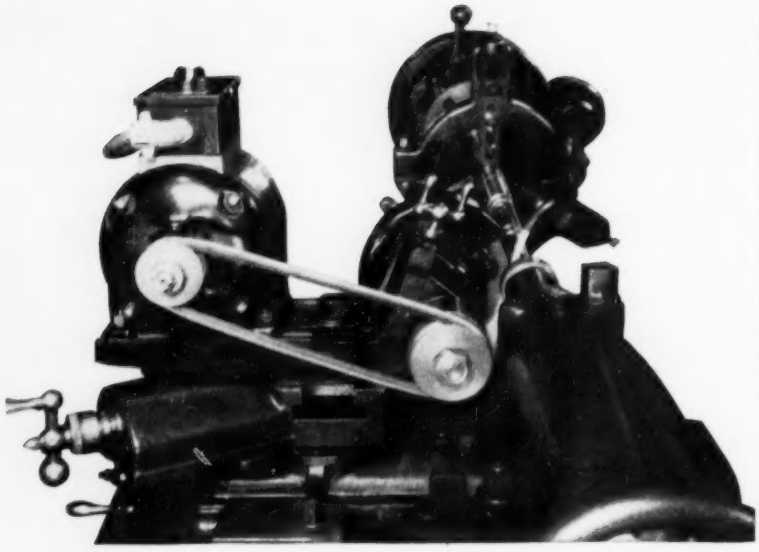

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INDEX TO ADVERTISERS

(Continued from page 261)

	Page
Ruthman Machinery Co.	206
Ryerson & Sons Inc., Joseph T.	152
Schenck, Carl, Maschinenfabrik	222
Scherr Co. Inc., George 222, 234, 238,	242
Sheffield Corp.	102
Shore Instrument & Mfg. Co. Inc.	236
Sid Tool Company	260
Sidney Machine Tool Co.	167
Simpson Electric Co.	47
Size Control Company Div. American Gage & Machine Co.	47
Smit & Sons Inc., J. K.	261
Spiertz, S. A.	234
Springfield Machine Tool Co.	57
Square D Co.	175
Stahl Gear & Machine Co.	232
Standard Pressed Steel Co.	56B
Standard Tool Co.	68
Sundstrand Machine Tool Co.	34-35
Sun Oil Co.	150
Taft Peirce Mfg. Co.	235
Timken Roller Bearing Co.	4th Cover
Union Carbide & Carbon Corp.	46
U. S. Electrical Tool Div. Emerson Electrical Mfg. Co.	236
United States Steel Supply Div.	65
Van Keuren Co.	16
Van Norman Co.	8-9
Vinco Corp.	195
Vulcan Tool Corp.	238
Waldes Koh-I-Noor Inc.	205
Walker Co. Inc., O. S.	242
Walsh Press & Die Co.	47
Waltham Machine Works	232
Warner & Swasey Co.	22-23
Weisser & Co. K. G., Eugen	32
Weldon Tool Co.	220
Westinghouse Electric Corp. Electronics Div.	28
Westinghouse Electric Corp.	39

INDEX TO ADVERTISERS

	Page
Wickman Manufacturing Co.	148
Wilson Co., K. R.	36
Wilson Mechanical Instrument Co.	242
Winter Brothers Co.	52
Wirth & Son Inc., Carl	262
Zahnraderfabrik Zuffenhausen	243
Zeh & Hahnemann Co.	238

SEARCHLIGHT SECTION

(Classified Advertising)

H. E. Hilty, Mgr.

EMPLOYMENT	Page
Positions Vacant	244
Selling Opportunity Offered	244
Selling Opportunity Wanted	244, 245
Employment Services	244
SPECIAL SERVICES	
Contract Work	245
Chowning Regulator Corp.	245
Eastern Machine Screw Corp.	245
Eisler Engineering Co., Inc.	245
General Pattern Works	245
Lafayette Grinding Corp.	245
Michel Mfg. Co.	245
EQUIPMENT (Used or Surplus New) For Sale	246-256
WANTED Equipment	245

ADVERTISERS INDEX

Aaron Machinery Corp.	255
Acorn Iron & Supply Co.	256
Behr & Sons Inc., Joseph	252
Bennett Machinery Corp.	254
Botwinik Bros. of Mass Inc.	246
Brownell Machine Tools Inc., Hazard	255
Chandler & Co., Inc., Rupert	254
Continental Tooling Service	244
Cowden Machinery Co., Inc.	256
Cox Machinery Co., Inc.	248
Currier Machine Sales	250
DeWitt Equipment Co.	248
Dony Machinery Co., D. E.	256
Eastern Machinery Co.	251
Electric Equipment Co.	256
Fairfield Equipment Co.	255
Falk Machinery Co.	247
Hill-Clarke Machinery Co.	253
Indianapolis Machinery & Supply Co.	252
Johnson Machinery Co.	256
MacDell Corp.	250
Miles Machinery Co.	246
Morey Machinery Co.	254
Motch & Merryweather Machinery Co.	256
Murray Company of Texas Inc.	245
National Machinery Exchange	252
National Surplus Sales Co.	245
Nikor Products Co.	254
O'Brien, Clarence J.	246
O'Connell Machinery Co.	254
Triplex Machine Tool Corp.	249
Vine, Inc., R. A.	254
Welling & Woodard Inc.	245
Westinghouse Electric Corp.	244
Wigglesworth Industrial Corp.	252
Williams, Edward Hale	254
Winston Machinery Co., Inc.	254, 256
Worcester Automatic Rebuilding Co.	250

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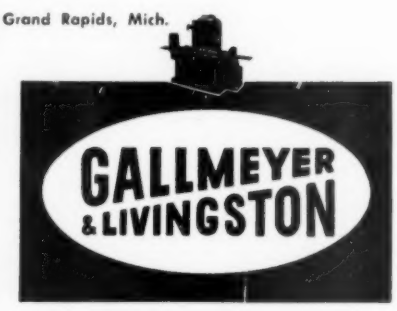

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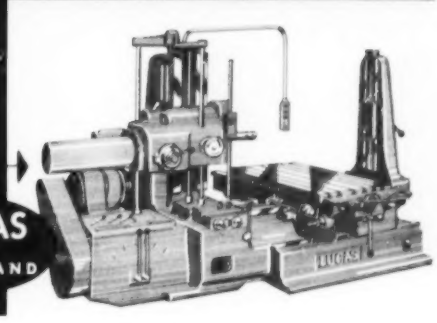
. . . Machines for Making Progress

Lucas Horizontal Boring, Drilling and Milling Machines



Makes delicate cuts on short, thin-wall, large diameter parts automatically

with help of TIMKEN® bearings

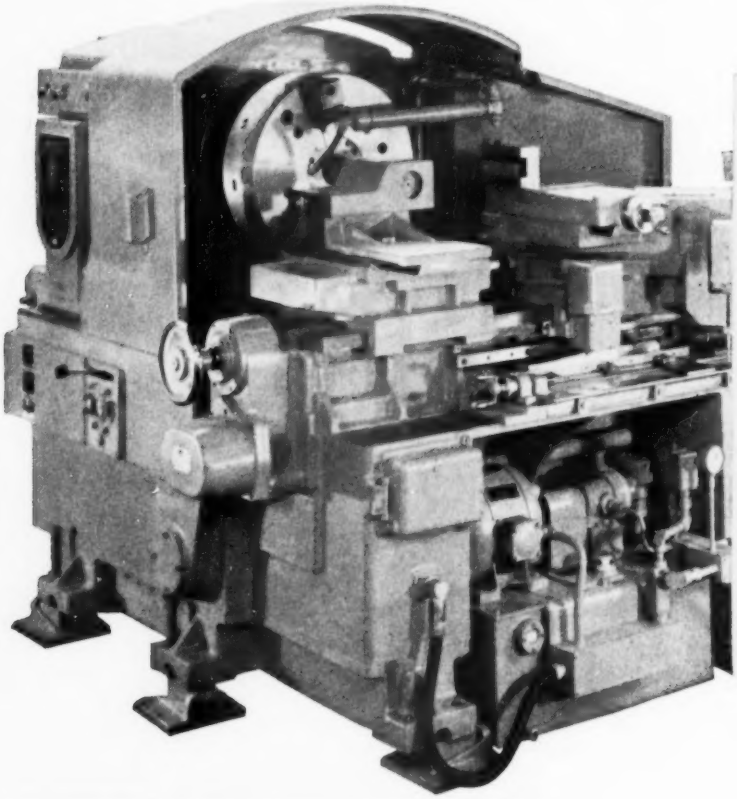
SPEED, precision and automatic operation—these are the machining qualities built into Lodge & Shipley's new 30″ T-Matic. With the bed at right angles to the spindle, it face contours, bores, turns big parts with small-lathe accuracy.

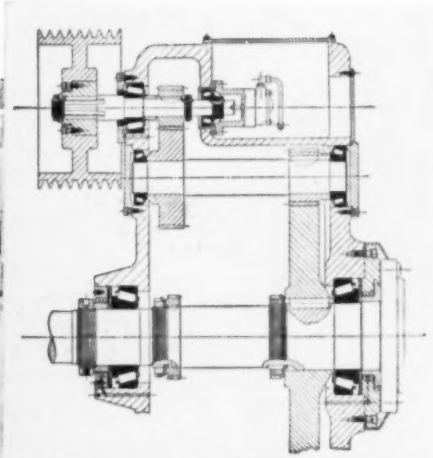
Since all the T-Lathe's work is single chucked, the spindle must be completely free of end play. Otherwise face contouring accuracy would be affected. Any wobble or chatter in the spindle would be doubled or tripled near the outside of large diameter parts.

For these reasons, Lodge & Shipley mounted the spindle on 2 Timken® bearings. Their tapered rollers are preloaded during assembly, eliminating both end and side play. Since the spindle must support large work pieces, these are large diameter bearings. Yet their run-out never exceeds three ten-thousandths of an inch (.0003″).

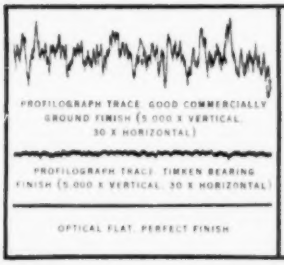
Made of the Timken Company's own fine alloy steel, Timken bearings normally last the life of the machine tool they're a part of. Building or buying machines, specify "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.





How **THE LODGE & SHIPLEY COMPANY** mounts T-Lathe spindle on Timken bearings to get accuracy needed for delicate work on large diameter pieces.


PROFILOGRAPH TRACE. GOOD COMMERCIALLY GROUND FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
PROFILOGRAPH TRACE. TIMKEN BEARING FINISH (5,000 X VERTICAL, 30 X HORIZONTAL)
OPTICAL FLAT. PERFECT FINISH

SMOOTH TO MILLIONTHS OF AN INCH

Surface finish of high quality Timken bearing rollers and races is so smooth that it takes a profilograph to measure its smoothness. This instrument measures surface variations to a millionth of an inch, as shown at the left.

TIMKEN

TAPERED ROLLER BEARINGS

NOT JUST A BALL — NOT JUST A ROLLER — THE TIMKEN TAPERED ROLLER — BEARING TAKES RADIAL AND THRUST — LOADS OR ANY COMBINATION